



(51) International Patent Classification:
H04L 5/00 (2006.01)

(21) International Application Number:
PCT/US201 1/043064

(22) International Filing Date:
6 July 201 1 (06.07.201 1)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/363,068 9 July 2010 (09.07.2010) US

(71) Applicant (for all designated States except US): **INTER-DIGITAL PATENT HOLDINGS, INC.** [US/US]; 341 1 Silverside Road, Concord Plaza, Suite 105, Hagley Building, Wilmington, Delaware 198 10 (US).

(72) Inventors; and

(75) Inventors/ Applicants (for US only): **WANG, Lei** [CA/US]; 13519 Ginger Glen Road, San Diego, California 92130 (US). **MURIAS, Ronald G.** [CA/CA]; 5127 Viceroy Drive NW, Calgary, Alberta T3A 0V2 (CA).

(74) Agent: **SCHOTT, Stephen B.**; Volpe and Koenig, P.C., 30 S. 17th Street, United Plaza, Suite 1600, Philadelphia, Pennsylvania 19103 (US).

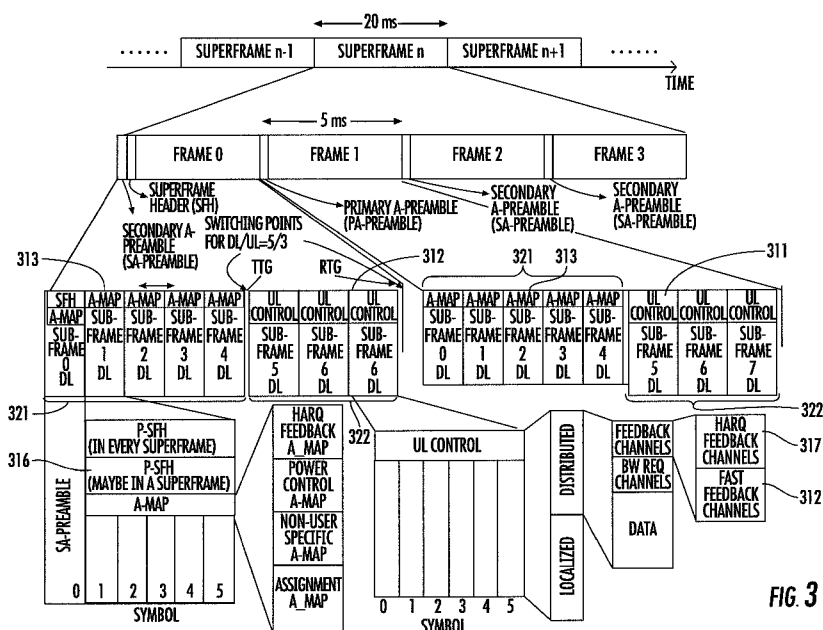
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: RESOURCE ALLOCATION SIGNALING OF WIRELESS COMMUNICATION NETWORKS



(57) Abstract: A method and apparatus addresses resource allocation granularity issues for encoding efficiency of resource allocation signaling in assignment information elements (IEs).

RESOURCE ALLOCATION SIGNALING OF WIRELESS COMMUNICATION NETWORKS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. provisional application No. 61/363,068 filed on July 9, 2010, the contents of which is hereby incorporated by reference herein.

BACKGROUND

[0002] In an advanced broadband wireless system, an air link refers to a communication channel between the BS (Base Station) and an MS (Mobile Station) using the air as media. A scheduling-based media access control (MAC) is used to manage/control the usage of the air link resources. With the scheduling-based MAC, the BS uses collected information about resource requirements to allocate air link resource for the MSs, where the resource allocations are specified in the control signal, called Advanced MAP (A-MAP) Information Elements (IEs). An A-MAP IE specifies who, when, where, and how to transmit/receive. The when and where specifies the air link resources in an orthogonal frequency division multiple access (OFDMA) two-dimensional frame structure in both time-domain and frequency-domain.

SUMMARY

[0003] A method for resource allocation in assignment of information elements (IEs) comprises defining sets of selective starting locations (L) and allocation sizes (S) in combinations (L,S) for resource allocations, based on a predetermined total number of available logical resource units (LRUs) and valid resource allocations; and defining a mapping of a resource index to each combination (L,S), wherein the location size S is a number of LRUs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] A more detailed understanding may be had from the following description, given by way of example in conjunction with the accompanying drawings wherein:

[0005] FIG. 1A is a system diagram of an example communications system in which one or more disclosed embodiments may be implemented;

[0006] FIG. 1B is a system diagram of an example wireless transmit/receive unit (WTRU) that may be used within the communications system illustrated in FIG. 1A;

[0007] FIG. 1C is a system diagram of an example radio access network and an example core network that may be used within the communications system illustrated in FIG. 1A;

[0008] FIG. 2A is an example of a downlink (DL) physical (PHY) structure with frequency partitions and different types of logical resource units (LRUs);

[0009] FIG. 2B shows an example mapping for the PHY structure shown in FIG. 2A; and

[0010] FIG. 3 is an example of control channel allocations.

DETAILED DESCRIPTION

[0011] Resource allocation constraints may be used to reduce the number of valid allocations so that the required signaling information field in the assignment A-MAP IEs may be efficiently coded by only signaling the valid allocations. For example, one allocation may not cross two different LRU types (e.g., miniband LRU (NLRU), subband LRU (SLRU) or distributed LRU (DLRU),

but not mixed), and/or one allocation may be contained in the same frequency partition and may not span multiple frequency partitions.

[0012] The A-MAP IE mapping may be constrained and reduced by not mapping to resource locations for resources occupied by the downlink and uplink control channels in a subframe.

[0013] The assignable allocation sizes may be limited, the allocation starting position may be limited, or both the sizes and the starting locations may be limited to reduce the required RI (Resource Index) mapping.

[0014] Information regarding the maximum allocation size, the given STC_rate and the TTI_length may be used to derive the value range of the number of LRUs for an allocation so that the number of allocations that need to be signaled in the assignment A-MAP IEs may be effectively reduced.

[0015] The size of RI (Resource Index) may be extended by one or more additional bits that are reserved and unused, or by reshuffling some other fields of the current assignment A-MAP IE.

[0016] Additionally, other mechanisms may be used to support allocations of discrete LRUs.

[0017] These embodiments may be used independently or in any combination.

[0018] FIG. 1A is a diagram of an example communications system 100 in which one or more disclosed embodiments may be implemented. The communications system 100 may be a multiple access system that provides content, such as voice, data, video, messaging, broadcast, etc., to multiple wireless users. The communications system 100 may enable multiple wireless users to access such content through the sharing of system resources, including wireless bandwidth. For example, the communications systems 100 may employ one or more channel access methods, such as code division multiple access

(CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal FDMA (OFDMA), single-carrier FDMA (SC-FDMA), and the like.

[0019] As shown in FIG. 1A, the communications system 100 may include wireless transmit/receive units (WTRUs) 102a, 102b, 102c, 102d, a radio access network (RAN) 104, a core network 106, a public switched telephone network (PSTN) 108, the Internet 110, and other networks 112, though it will be appreciated that the disclosed embodiments contemplate any number of WTRUs, base stations, networks, and/or network elements. Each of the WTRUs 102a, 102b, 102c, 102d may be any type of device configured to operate and/or communicate in a wireless environment. By way of example, the WTRUs 102a, 102b, 102c, 102d may be configured to transmit and/or receive wireless signals and may include user equipment (UE), a mobile station, a fixed or mobile subscriber unit, a pager, a cellular telephone, a personal digital assistant (PDA), a smartphone, a laptop, a netbook, a personal computer, a wireless sensor, consumer electronics, an advanced mobile station (MS), and the like.

[0020] The communications systems 100 may also include a base station 114a and a base station 114b. Each of the base stations 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more communication networks, such as the core network 106, the Internet 110, and/or the networks 112. By way of example, the base stations 114a, 114b may be a base transceiver station (BTS), a Node-B, an eNode B, a Home Node B, a Home eNode B, a site controller, an access point (AP), a wireless router, an advanced base station (BS), and the like. While the base stations 114a, 114b are each depicted as a single element, it will be appreciated that the base stations 114a, 114b may include any number of interconnected base stations and/or network elements.

[0021] The base station 114a may be part of the RAN 104, which may also include other base stations and/or network elements (not shown), such as a base station controller (BSC), a radio network controller (RNC), relay nodes, etc. The base station 114a and/or the base station 114b may be configured to transmit and/or receive wireless signals within a particular geographic region, which may be referred to as a cell (not shown). The cell may further be divided into cell sectors. For example, the cell associated with the base station 114a may be divided into three sectors. Thus, in one embodiment, the base station 114a may include three transceivers, i.e., one for each sector of the cell. In another embodiment, the base station 114a may employ multiple-input multiple output (MIMO) technology and, therefore, may utilize multiple transceivers for each sector of the cell.

[0022] The base stations 114a, 114b may communicate with one or more of the WTRUs 102a, 102b, 102c, 102d over an air interface 116, which may be any suitable wireless communication link (e.g., radio frequency (RF), microwave, infrared (IR), ultraviolet (UV), visible light, etc.). The air interface 116 may be established using any suitable radio access technology (RAT).

[0023] More specifically, as noted above, the communications system 100 may be a multiple access system and may employ one or more channel access schemes, such as CDMA, TDMA, FDMA, OFDMA, SC-FDMA, and the like. For example, the base station 114a in the RAN 104 and the WTRUs 102a, 102b, 102c may implement a radio technology such as Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (UTRA), which may establish the air interface 116 using wideband CDMA (WCDMA). WCDMA may include communication protocols such as High-Speed Packet Access (HSPA) and/or Evolved HSPA (HSPA+). HSPA may include High-Speed Downlink Packet Access (HSDPA) and/or High-Speed Uplink Packet Access (HSUPA).

[0024] In another embodiment, the base station 114a and the WTRUs 102a, 102b, 102c may implement a radio technology such as Evolved UMTS Terrestrial Radio Access (E-UTRA), which may establish the air interface 116 using Long Term Evolution (LTE) and/or LTE-Advanced (LTE-A).

[0025] In other embodiments, the base station 114a and the WTRUs 102a, 102b, 102c may implement radio technologies such as IEEE 802.16 (i.e., Worldwide Interoperability for Microwave Access (WiMAX)), CDMA2000, CDMA2000 1X, CDMA2000 EV-DO, Interim Standard 2000 (IS-2000), Interim Standard 95 (IS-95), Interim Standard 856 (IS-856), Global System for Mobile communications (GSM), Enhanced Data rates for GSM Evolution (EDGE), GSM EDGE (GERAN), and the like.

[0026] The base station 114b in FIG. 1A may be a wireless router, Home Node B, Home eNode B, BS, or access point, for example, and may utilize any suitable RAT for facilitating wireless connectivity in a localized area, such as a place of business, a home, a vehicle, a campus, and the like. In one embodiment, the base station 114b and the WTRUs 102c, 102d may implement a radio technology such as IEEE 802.11 to establish a wireless local area network (WLAN). In another embodiment, the base station 114b and the WTRUs 102c, 102d may implement a radio technology such as IEEE 802.15 to establish a wireless personal area network (WPAN). In yet another embodiment, the base station 114b and the WTRUs 102c, 102d may utilize a cellular-based RAT (e.g., WCDMA, CDMA2000, GSM, LTE, LTE-A, etc.) to establish a picocell or femtocell. As shown in FIG. 1A, the base station 114b may have a direct connection to the Internet 110. Thus, the base station 114b may not be required to access the Internet 110 via the core network 106.

[0027] The RAN 104 may be in communication with the core network 106, which may be any type of network configured to provide voice, data, applications,

and/or voice over internet protocol (VoIP) services to one or more of the WTRUs 102a, 102b, 102c, 102d. For example, the core network 106 may provide call control, billing services, mobile location-based services, pre-paid calling, Internet connectivity, video distribution, etc., and/or perform high-level security functions, such as user authentication. Although not shown in FIG. 1A, it will be appreciated that the RAN 104 and/or the core network 106 may be in direct or indirect communication with other RANs that employ the same RAT as the RAN 104 or a different RAT. For example, in addition to being connected to the RAN 104, which may be utilizing an E-UTRA radio technology, the core network 106 may also be in communication with another RAN (not shown) employing a GSM radio technology.

[0028] The core network 106 may also serve as a gateway for the WTRUs 102a, 102b, 102c, 102d to access the PSTN 108, the Internet 110, and/or other networks 112. The PSTN 108 may include circuit-switched telephone networks that provide plain old telephone service (POTS). The Internet 110 may include a global system of interconnected computer networks and devices that use common communication protocols, such as the transmission control protocol (TCP), user datagram protocol (UDP) and the internet protocol (IP) in the TCP/IP internet protocol suite. The networks 112 may include wired or wireless communications networks owned and/or operated by other service providers. For example, the networks 112 may include another core network connected to one or more RANs, which may employ the same RAT as the RAN 104 or a different RAT.

[0029] Some or all of the WTRUs 102a, 102b, 102c, 102d in the communications system 100 may include multi-mode capabilities, i.e., the WTRUs 102a, 102b, 102c, 102d may include multiple transceivers for communicating with different wireless networks over different wireless links. For example, the WTRU 102c shown in FIG. 1A may be configured to

communicate with the base station 114a, which may employ a cellular-based radio technology, and with the base station 114b, which may employ an IEEE 802 radio technology.

[0030] FIG. 1B is a system diagram of an example WTRU 102. As shown in FIG. 1B, the WTRU 102 may include a processor 118, a transceiver 120, a transmit/receive element 122, a speaker/microphone 124, a keypad 126, a display/touchpad 128, non-removable memory 106, removable memory 132, a power source 134, a global positioning system (GPS) chipset 136, and other peripherals 138. It will be appreciated that the WTRU 102 may include any sub-combination of the foregoing elements while remaining consistent with an embodiment.

[0031] The processor 118 may be a general purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits (ASICs), Field Programmable Gate Array (FPGAs) circuits, any other type of integrated circuit (IC), a state machine, and the like. The processor 118 may perform signal coding, data processing, power control, input/output processing, and/or any other functionality that enables the WTRU 102 to operate in a wireless environment. The processor 118 may be coupled to the transceiver 120, which may be coupled to the transmit/receive element 122. While FIG. 1B depicts the processor 118 and the transceiver 120 as separate components, it will be appreciated that the processor 118 and the transceiver 120 may be integrated together in an electronic package or chip.

[0032] The transmit/receive element 122 may be configured to transmit signals to, or receive signals from, a base station (e.g., the base station 114a) over the air interface 116. For example, in one embodiment, the transmit/receive

element 122 may be an antenna configured to transmit and/or receive RF signals. In another embodiment, the transmit/receive element 122 may be an emitter/detector configured to transmit and/or receive IR, UV, or visible light signals, for example. In yet another embodiment, the transmit/receive element 122 may be configured to transmit and receive both RF and light signals. It will be appreciated that the transmit/receive element 122 may be configured to transmit and/or receive any combination of wireless signals.

[0033] In addition, although the transmit/receive element 122 is depicted in FIG. 1B as a single element, the WTRU 102 may include any number of transmit/receive elements 122. More specifically, the WTRU 102 may employ MIMO technology. Thus, in one embodiment, the WTRU 102 may include two or more transmit/receive elements 122 (e.g., multiple antennas) for transmitting and receiving wireless signals over the air interface 116.

[0034] The transceiver 120 may be configured to modulate the signals that are to be transmitted by the transmit/receive element 122 and to demodulate the signals that are received by the transmit/receive element 122. As noted above, the WTRU 102 may have multi-mode capabilities. Thus, the transceiver 120 may include multiple transceivers for enabling the WTRU 102 to communicate via multiple RATs, such as UTRA and IEEE 802.11, for example.

[0035] The processor 118 of the WTRU 102 may be coupled to, and may receive user input data from, the speaker/microphone 124, the keypad 126, and/or the display/touchpad 128 (e.g., a liquid crystal display (LCD) display unit or organic light-emitting diode (OLED) display unit). The processor 118 may also output user data to the speaker/microphone 124, the keypad 126, and/or the display/touchpad 128. In addition, the processor 118 may access information from, and store data in, any type of suitable memory, such as the non-removable memory 106 and/or the removable memory 132. The non-removable memory 106

may include random-access memory (RAM), read-only memory (ROM), a hard disk, or any other type of memory storage device. The removable memory 132 may include a subscriber identity module (SIM) card, a memory stick, a secure digital (SD) memory card, and the like. In other embodiments, the processor 118 may access information from, and store data in, memory that is not physically located on the WTRU 102, such as on a server or a home computer (not shown).

[0036] The processor 118 may receive power from the power source 134, and may be configured to distribute and/or control the power to the other components in the WTRU 102. The power source 134 may be any suitable device for powering the WTRU 102. For example, the power source 134 may include one or more dry cell batteries (e.g., nickel-cadmium (NiCd), nickel-zinc (NiZn), nickel metal hydride (NiMH), lithium-ion (Li-ion), etc.), solar cells, fuel cells, and the like.

[0037] The processor 118 may also be coupled to the GPS chipset 136, which may be configured to provide location information (e.g., longitude and latitude) regarding the current location of the WTRU 102. In addition to, or in lieu of, the information from the GPS chipset 136, the WTRU 102 may receive location information over the air interface 116 from a base station (e.g., base stations 114a, 114b) and/or determine its location based on the timing of the signals being received from two or more nearby base stations. It will be appreciated that the WTRU 102 may acquire location information by way of any suitable location-determination method while remaining consistent with an embodiment.

[0038] The processor 118 may further be coupled to other peripherals 138, which may include one or more software and/or hardware modules that provide additional features, functionality and/or wired or wireless connectivity. For example, the peripherals 138 may include an accelerometer, an e-compass, a

satellite transceiver, a digital camera (for photographs or video), a universal serial bus (USB) port, a vibration device, a television transceiver, a hands free headset, a Bluetooth® module, a frequency modulated (FM) radio unit, a digital music player, a media player, a video game player module, an Internet browser, and the like.

[0039] FIG. 1C is a system diagram of the RAN 104 and the core network 106 according to an embodiment. The RAN 104 may be an access service network (ASN) that employs IEEE 802.16 radio technology to communicate with the WTRUs 102a, 102b, 102c over the air interface 116. As will be further discussed below, the communication links between the different functional entities of the WTRUs 102a, 102b, 102c, the RAN 104, and the core network 106 may be defined as reference points.

[0040] As shown in FIG. 1C, the RAN 104 may include base stations 140a, 140b, 140c, and an ASN gateway 142, though it will be appreciated that the RAN 104 may include any number of base stations and ASN gateways while remaining consistent with an embodiment. The base stations 140a, 140b, 140c may each be associated with a particular cell (not shown) in the RAN 104 and may each include one or more transceivers for communicating with the WTRUs 102a, 102b, 102c over the air interface 116. In one embodiment, the base stations 140a, 140b, 140c may implement MIMO technology. Thus, the base station 140a, for example, may use multiple antennas to transmit wireless signals to, and receive wireless signals from, the WTRU 102a. The base stations 140a, 140b, 140c may also provide mobility management functions, such as handoff triggering, tunnel establishment, radio resource management, traffic classification, quality of service (QoS) policy enforcement, and the like. The ASN gateway 142 may serve as a traffic aggregation point and may be responsible for paging, caching of subscriber profiles, routing to the core network 106, and the like. A scheduling-

based MAC may be implemented within the base stations 140a, 140b, 140c and/or the ASN gateway 142 for execution of the resource mapping according to the methods described herein. The base stations, 140a, 140b, and 140c may provide the resource mapping descriptions/instructions for the subscribers, where the ASN gateway and/or other network entities may provide information to the BS to make the right resource allocation decisions.

[0041] The air interface 116 between the WTRUs 102a, 102b, 102c and the RAN 104 may be defined as an R1 reference point that implements the IEEE 802.16 specification. In addition, each of the WTRUs 102a, 102b, 102c may establish a logical interface (not shown) with the core network 106. The logical interface between the WTRUs 102a, 102b, 102c and the core network 106 may be defined as an R2 reference point, which may be used for authentication, authorization, IP host configuration management, and/or mobility management.

[0042] The communication link between each of the base stations 140a, 140b, 140c may be defined as an R8 reference point that includes protocols for facilitating WTRU handovers and the transfer of data between base stations. The communication link between the base stations 140a, 140b, 140c and the ASN gateway 215 may be defined as an R6 reference point. The R6 reference point may include protocols for facilitating mobility management based on mobility events associated with each of the WTRUs 102a, 102b, 100c.

[0043] As shown in FIG. 1C, the RAN 104 may be connected to the core network 106. The communication link between the RAN 104 and the core network 106 may be defined as an R3 reference point that includes protocols for facilitating data transfer and mobility management capabilities, for example. The core network 106 may include a mobile IP home agent (MIP-HA) 144, an authentication, authorization, accounting (AAA) server 146, and a gateway 148. While each of the foregoing elements are depicted as part of the core network

106, it will be appreciated that any one of these elements may be owned and/or operated by an entity other than the core network operator.

[0044] The MIP-HA may be responsible for IP address management, and may enable the WTRUs 102a, 102b, 102c to roam between different ASNs and/or different core networks. The MIP-HA 144 may provide the WTRUs 102a, 102b, 102c with access to packet-switched networks, such as the Internet 110, to facilitate communications between the WTRUs 102a, 102b, 102c and IP-enabled devices. The AAA server 146 may be responsible for user authentication and for supporting user services. The gateway 148 may facilitate interworking with other networks. For example, the gateway 148 may provide the WTRUs 102a, 102b, 102c with access to circuit-switched networks, such as the PSTN 108, to facilitate communications between the WTRUs 102a, 102b, 102c and traditional land-line communications devices. In addition, the gateway 148 may provide the WTRUs 102a, 102b, 102c with access to the networks 112, which may include other wired or wireless networks that are owned and/or operated by other service providers.

[0045] Although not shown in FIG. 1C, it will be appreciated that the RAN 104 may be connected to other ASNs and the core network 106 may be connected to other core networks. The communication link between the RAN 104 and the other ASNs may be defined as an R4 reference point, which may include protocols for coordinating the mobility of the WTRUs 102a, 102b, 102c between the RAN 104 and the other ASNs. The communication link between the core network 106 and the other core networks may be defined as an R5 reference, which may include protocols for facilitating interworking between home core networks and visited core networks.

[0046] With respect to the A-MAP information elements (IEs) used to specify downlink and uplink resource allocations, a 20MHz channel may be

specified having 96 logical resource units (LRUs), for a total number of 4656 possible allocations to be indexed. While this would require a 13-bit Resource Index (RI), one current specification calls for a smaller 11-bit RI, which cannot accommodate the full 4696 possible allocations. One solution is to compress the indexes by incrementing an allocation location index L and an allocation size index S which reduces the total number of indexes. The allocation location index L denotes a starting location of the allocated LRUs, and the allocation size index S represents the number of allocated LRUs (i.e., an LRU allocation consists of S contiguous LRUs starting from the LRU with index L).

[0047] Examples of index L and index S that utilize an 11-bit RI, include the following: when $14 \leq S \leq 24$, L may be incremented by 2 LRUs; when $28 \leq S \leq 48$, L may be incremented by 4 LRUs; and when $56 \leq S \leq 88$, L may be incremented by 8 LRUs. However, using these assignment granularities of 1, 2, 4, or 8 LRUs for index L, air link resources may be wasted when the required size does not fit exactly into one of the allowed sizes. For example, if the required size is 57 LRUs, which is not an allowed size, the next allowed size is 64, thus 7 extra LRUs are needed (i.e., $7/57 = 12.28\%$ extra). In addition, the number of LRUs specified in the assignment IEs is for one subframe. The number of extra LRUs due to this allocation granularity issue may become much worse in the long transmission time interval (TTI) cases and/or the space time control (STC) case where $STC_rate > 1$, because the allocation size is the product of STC_rate, long TTI factor, and the number of LRUs specified in the assignment IE.

[0048] Rate matching is the process where the number of bits to be transmitted is reduced to fit the allocated size. Typically, some redundant bits (generated by a forward error correction scheme) in the stream are removed to reduce the size of the block to be transmitted. When the rate-matching scheme is used, and the required number of LRUs is not an assignable size, the number of

allocated LRUs may be either smaller or greater than the required number of LRUs. In this case, the offset may be as big as 4 LRUs (e.g., when the required number of LRUs is 60, and the two closest assignable sizes are 56 and 64). An offset of 4 LRUs is significant. The methods and apparatus described herein may improve the encoding efficiency of resource allocation signaling in the assignment IEs, and also improve the resource usage efficiency allocation granularity.

[0049] The downlink/uplink basic assignment A-MAP IE may apportion a single allocation of resources, comprising a set of contiguous LRUs in a downlink/uplink advanced air interface (AAI) subframe, where the allocated set of contiguous LRUs may be contained within the same frequency partition (i.e., the allocated set of contiguous LRUs may not span multiple frequency partitions). The allocated set of contiguous LRUs may be of the same type (e.g., DLRU, NLRU, or SLRU).

[0050] Using the same frequency partition and the same type of LRUs for resource allocation improves the resource allocation specification encodings, by elimination of invalid combinations of allocation starting points and allocation sizes.

[0051] Figure 2A shows an example of a downlink PHY structure based on a subframe divided into frequency partitions (multi-cell), each partition having a set of physical resource units (PRUs) across a total number of available OFDMA symbols. Each frequency partition can include contiguous (localized) and/or distributed PRUs (cell specific). The PRU is the basic physical unit for resource allocation having a number of consecutive subcarriers (SC1, SC2...SCn) by a number of consecutive OFDMA symbols.

[0052] Figure 2B shows an example of resource mapping from PRUs to LRUs, which includes subband partitioning, miniband partitioning, and frequency partitioning. The PRUs are first partitioned by subbands PRUSB and

minibands PRUMB. As shown in Figure 2, there are 7 subbands. A permutation on the minibands is performed based on the channel bandwidth, shown as PRUMB to PPRUMB, to ensure frequency diverse PRUs are allocated to each frequency partition. The subbands PRUSB and the minibands PRUMB are then allocated to one or more frequency partitions, shown as PRUFPO to PRUFP3, according to a frequency partition count (FPCT). In this example, $FPCT = 4$, as there are four frequency partitions. The allocation is also based on a defined frequency partition size (FPS) (e.g., $FPS=12$) as the number of PRUs allocated to the i -th frequency partition, along with the number of subbands allocated to the i -th frequency partition (e.g., downlink frequency partition subband count (DFPSC = 2)).

[0053] Finally, a cell-specific resource mapping may be performed that maps the frequency partitions to LRUs, which are divided into contiguous resource units (CRUs) and distributed resource units (DRUs). The CRUs include miniband CRUs (NRLUs) and subband CLUs (SRLUs). In the A-MAP assignment IEs, an ordered LRU list, $LRU[1]$ to $LRU[NMAX]$, may be used to specify an allocation, where the LRU list is specified by mapping the DRUs, NLRUs, and SLRUs in different frequency partitions in a certain order. For an example where there are four frequency partitions, the mapping order may be: $FP0(DLRUs, NLRUs, SLRUs)$, $FP1(DLRUs, NLRUs, SLRUs)$, $FP2(DLRUs, NLRUs, SLRUs)$, and $FP3(DLRUs, NLRUs, SLRUs)$.

[0054] When applying the constraints of same frequency partition and the same type of LRUs for a resource allocation, the number of valid allocations in a subframe may be significantly reduced for the PHY subframe structure with multiple frequency partitions and/or multiple types of LRUs. As an example, for the mapping shown in Figure 2B, the number of valid allocations can be reduced to 172, when compared to 1186 valid allocations that would exist without

applying the constraints of the same frequency and the same LRU type, which results in an 85.37% reduction. Fig 2B shows 172 valid allocations, and 1186 possible combinations of (L, S). These numbers come from calculations for the combinations of starting location (L) and allocation size (S) shown in the following table.

TABLE 1

DL PHY with 10MHz, 4 FRs, multiple types of LRUs (DLRUs, SB-CRUs, and MB-CRUs)

Location	# of valid sizes	#of possible sizes
1	4	48
2	3	47
3	2	46
4	1	45
5	2	44
6	1	43
7	6	42
8	5	41
9	4	40
10	3	39
11	2	38
12	1	37
13	8	36
14	7	35
15	6	34
16	5	33
17	4	32
18	3	31
19	2	30
20	1	29
21	4	28
22	3	27
23	2	26
24	1	25
25	8	24
26	7	23
27	6	22
28	5	21
29	4	20

30	3	19
21	2	28
32	1	17
33	4	16
34	3	15
35	2	14
36	1	13
37	8	12
38	7	11
39	6	10
40	5	9
41	4	8
42	3	7
43	2	6
44	1	5
45	4	4
46	3	3
47	2	2
48	1	1
	172	1186
	valid allocations in (L, S) combinations	all possible (L, S) combinations

[0055] This reduction may be useful in resolving the 11-bit RI index code deficit with respect to the maximum 4656 allocations in 20MHz systems, requiring a 13-bit RI.

[0056] For each combination of system channel bandwidth (e.g., 5MHz, 10MHz, or 20MHz), frequency partitions, and LRU type compositions (such as the mapping shown in Figure 2B), there exists a table entry in an RI table, which uses an 11-bit RI value as a table index, and each table entry includes corresponding index values (L,S), representing a valid allocation. The RI tables are used at both the WTRU 102 and the base station 114 to code and decode the assignment A-MAP IEs. Both the frequency partitioning and the LRU structure may be included in the system configuration information, which are either static or semi-static for a system deployment.

[0057] The downlink and uplink frequency partitions may be defined in a frame header, such as a Secondary Super Frame Header (S-SFH), by parameters Downlink Frequency Partition Configuration (DFPC) and Uplink Frequency Partition Configuration (UFPC), respectively. For both downlink and uplink, the number of defined frequency partitions varies with fast Fourier transform (FFT) sizes of the PHY system. For example, there may be n different frequency partition configurations for 2048-FFT, m configurations for 1024-FFT, and p configurations for 512-FFT, for both downlink and uplink.

[0058] The downlink/uplink LRU structures may also be defined in the S-SFH by parameters downlink/uplink Subband Allocation Count (DSAC/USAC), downlink/uplink Frequency Partition Subband Count (DFPSC/UFPSA), and downlink/uplink CRU Allocation Size (DCASi/UCASi). The number of different LRU structures also varies with the system FFT size. For example, for both downlink and uplink, there may be q valid subband allocations for 2048-FFT, r subband allocations for 1024-FFT, and s subband allocations for 512-FFT.

[0059] At least one of the following options are available for the above described resource mapping. Both the frequency partitioning and the LRU structure information may be included. Only the frequency partition information may be used. Only the LRU structure information may be used. Selecting either the frequency partition information and/or the LRU structure information only as needed (e.g., in 20MHz bandwidth systems).

[0060] As an alternative method for reducing resource allocation with respect to the assignment A-MAP IEs, the uplink and downlink control channels may be pre-defined or configured to resources such that the assignment A-MAP IEs do not need to perform this mapping. The existence of the non-assignable LRUs occupied by the control channels in the allocation specification encoding design reduces the number of valid allocations in a subframe.

[0061] Figure 3 shows an example of a frame structure with control channel allocations. As shown, for the downlink subframes 321, the A-MAP regions 313 may be present in all AAI subframes. For the uplink subframes 322, a hybrid automatic repeat request (HARQ) feedback region 317 may be present in all uplink subframes. The uplink control channels 311 may occupy the resources that are pre-defined or configured. In the uplink subframes 322, the number of DLRLUs reserved for Feedback channels 312 may be specified by a field UL_FEEDBACK_SIZE in the secondary superframe header (S-SFH) 316. Thus, there is no need for the assignment A-MAP IEs to do the allocations for the uplink feedback channels 312, thus reducing the number of allocations that need to be signaled in the assignment A-MAP IEs. By knowing the size of the A-MAP region 313 (defined as LAMAP LRUS) in a downlink subframe 321 and the size of uplink feedback channels 312 in an uplink subframe, the number of valid allocations for the assignment IEs to signal may be determined, and the mapping between the RI codes and valid allocations in terms of location and size indexes (L, S) may be defined, as previously described.

[0062] For example, if LAMAP = 6 LRUs in a 20MHz channel bandwidth, excluding the control channel occupied resources, the number of allocations for the A-MAP IE is 4095 after eliminating the size of the uplink feedback channels. This is a significant reduction of the full 4656 possible allocations without excluding the control channel occupied resources.

[0063] The assumption of LAMAP = 6 LRUs may be conservative. The A-MAP modulation/coding selections are quadrature phase-shift keying (QPSK) $\frac{1}{2}$, QPSK $\frac{1}{4}$, and QPSK $\frac{1}{8}$. One LRU may be 18 subcarriers*6 symbols = 108 tones, while typically there are 6 pilot tones. This gives 102 data bits for the QPSK $\frac{1}{2}$, and 51 data bits for the QPSK $\frac{1}{4}$. On the other hand, an assignment A-MAP IE is typically 56 bits (i.e., 40 bits data plus 16 bits CRC). In addition to the

assignment A-MAP IEs, the A-MAP region may also contain the HARQ feedback and power control IEs. Consider the number of data bits for an LRU carrier in the DL control channel, i.e., 51 bits for QPSK1/4, which is close to, but not enough, for one A-MAP IE. So, a DL control channel with 6 LRUs may accommodate 5 A-MAP IEs, i.e., specify 5 DL resource allocations. Further, a DL control channel may also carry other control information, e.g., HARQ feedback, power control IE, etc, in addition to A-MAP IEs. So, again, this may further be an indication of a need for DL resources for DL control channels.

[0064] As an alternative method for resource allocation of the A-MAP IEs, the starting location L may be selectively defined to reduce the number of allocations that need to be specified in an assignment A-MAP IE. Additionally, selective sizes of resource allocations may be employed. Mechanisms may be used to identify the resource allocations in a given size of resource index field when the given resource index field cannot accommodate the allocations with all the possible combinations of locations and sizes.

[0065] With respect to selective locations, starting point gaps may be created for sets of allocation sizes. As a first example using a 96 LRU mapping, for allocation sizes 1-12 LRUs, the starting location L may be defined for every possible location. For allocation sizes 13-24 LRUs, the starting location L may be defined to start on odd numbered locations only. For allocation sizes 25-48 LRUs, L may be defined to start on every 4th odd numbered location (1, 5, 9, ...). For allocation sizes 49-88 LRUs, L may be defined to start on every 8th odd numbered location (1, 9, 17, ...). For allocation sizes 89-96 LRUs, L may be defined to start on every possible location.

[0066] As a second example, which is a variation of the above first example mapping, the gapped starting location L may be defined as follows. For allocation sizes 1-12 LRUs, the starting location L may be defined for every possible

location. For allocation sizes 13-24 LRUs, the starting location L may be defined to start at the locations at increments of 3 (i.e., from 1, 4, 7, ...). For allocation sizes 25-76 LRUs, L may be defined to start at the locations at increments of 4 (i.e., from 1, 5, 9, ...). For allocation sizes 77-96 LRUs, L may be defined to start at the one location for each of the allocation sizes; for a given size, the starting location may be chosen so that the allocation ends at the highest LRU index (i.e., 96). With this example variation, 2048 total allocations are possible, which may be signaled by an 11-bit RI field in the assignment IEs.

[0067] These defined mappings are provided as examples, and this embodiment should not be considered limited to these examples, as other similar variations may be used.

[0068] Using any of the above defined allocation sets having starting locations L with the "gapped allocations", the larger size allocations may be mapped first, followed by mapping the smaller size allocations, which may start anywhere and to fill the gaps left by the large size allocations.

[0069] Table 2 shows valid allocations using selective locations for certain allocation sizes, in accordance with the above second example.

TABLE 2

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
1	{1~1},{2~2},{3~3},{4~4},{5~5},{6~6},{7~7},{8~8},{9~9},{10~10},{11~11},{12~12},{13~13},{14~14},{15~15},{16~16},{17~17},{18~18},{19~19},{20~20},{21~21},{22~22},{23~23},{24~24},{25~25},{26~26},{27~27},{28~28},{29~29},{30~30},{31~31},{32~32},{33~33},{34~34},{35~35},{36~36},{37~37},{38~38},{39~39},{40~40},{41~41},{42~42},{43~43},{44~44},{45~45},{46~46},{47~47},{48~48},{49~49},{50~50},{51~51},{52~52},{53~53},{54~54},{55~55},{56~56},{57~57},{58~58},{59~59},{60~60},{61~61},{62~62},{63~63},{64~64},{65~65},{66~66},{67~67},{68~68},{69~69},{70~70},{71~71},{72~72},{73~73},{74~74},{75~75},{76~76},{77~77},{78~78},{79~79},{80~80},{81~81},{82~82},{83~83},{84~84},{85~85},{86~86},{87~87},{88~88},{89~89},{90~90},{91~91},{92~92},{93~93},{94~94},{95~95},{96~96}	96
2	{1~2},{2~3},{3~4},{4~5},{5~6},{6~7},{7~8},{8~9},{9~10},{10~11},{11~12},{12~13},{13~14},{14~15},{15~16},{16~17},{17~18},{18~19},{19~20},{20~21},{21~22},{22~23},{23~24},{24~25},{25~26},{26~27},{27~28},{28~29},{29~30},{30~31},{31~32},{32~33},{33~34},{34~35},{35~36},{36~37},{37~38},{38~39},{39~40},{40~41},{41~42},{42~43},{43~44},{44~45},{45~46},{46~47},{47~48},{48~49},{49~50},{50~51},{51~52},{52~53},{53~54},{54~55},{55~56},{56~57},{57~58},{58~59},{59~60},{60~61},{61~62},{62~63},{63~64},{64~65},{65~66},{66~67},{67~68},{68~69},{69~70},{70~71},{71~72},{72~73},{73~74},{74~75},{75~76},{76~77},{77~78},{78~79},{79~80},{80~81},{81~82},{82~83},{83~84},{84~85},{85~86},{86~87},{87~88},{88~89},{89~90},{90~91},{91~92},{92~93},{93~94},{94~95},{95~96}	95
3	{1~3},{2~4},{3~5},{4~6},{5~7},{6~8},{7~9},{8~10},{9~11},{10~12},{11~13},{12~14},{13~15},{14~16},{15~17},{16~18},{17~19},{18~20},{19~21},{20~22},{21~23},{22~24},{23~25},{24~26},{25~27},{26~28},{27~29},{28~30},{29~31},{30~32},{31~33},{32~34},{33~35},{34~36},{35~37},{36~38},{37~39},{38~40},{39~41},{40~42},{41~43},{42~44},{43~45},{44~46},{45~47},{46~48},{47~49},{48~50},{49~51},{50~52},{51~53},{52~54},{53~55},{54~56},{55~57},{56~58},{57~59},{58~60},{59~61},{60~62},{61~63},{62~64},{63~65},{64~66},{65~67},{66~68},{67~69},{68~70},{69~71},{70~72},{71~73},{72~74},{73~75},{74~76},{75~77},{76~78},{77~79},{78~80},{79~81},{80~82},{81~83},{82~84},{83~85},{84~86},{85~87},{86~88},{87~89},{88~90},{89~91},{90~92},{91~93},{92~94},{93~95},{94~96}	94
4	{1~4},{2~5},{3~6},{4~7},{5~8},{6~9},{7~10},{8~11},{9~12},{10~13},{11~14},{12~15},{13~16},{14~17},{15~18},{16~19},{17~20},{18~21},{19~22},{20~23},{21~24},{22~25},{23~26},{24~27},{25~28},{26~29},{27~30},{28~31},{29~32},{30~33},{31~34},{32~35},{33~36},{34~37},{35~38},{36~39},{37~40},{38~41},{39~42},{40~43},{41~44},{42~45},{43~46},{44~47},{45~48},{46~49},{47~50},{48~51},{49~52},{50~53},{51~54},{52~55},{53~56},{54~57},{55~58},{56~59},{57~60},{58~61},{59~62},{60~63},{61~64},{62~65},{63~66},{64~67},{65~68},{66~69},{67~70},{68~71},{69~72},{70~73},{71~74},{72~75},{73~76},{74~77},{75~78},{76~79},{77~80},{78~81},{79~82},{80~83},{81~84},{82~85},{83~86},{84~87},{85~88},{86~89},{87~90},{88~91},{89~92},{90~93},{91~94},{92~95},{93~96}	93

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
5	{1~5},{2~6},{3~7},{4~8},{5~9},{6~10},{7~11},{8~12},{9~13},{10~14},{11~15},{12~16},{13~17},{14~18},{15~19},{16~20},{17~21},{18~22},{19~23},{20~24},{21~25},{22~26},{23~27},{24~28},{25~29},{26~30},{27~31},{28~32},{29~33},{30~34},{31~35},{32~36},{33~37},{34~38},{35~39},{36~40},{37~41},{38~42},{39~43},{40~44},{41~45},{42~46},{43~47},{44~48},{45~49},{46~50},{47~51},{48~52},{49~53},{50~54},{51~55},{52~56},{53~57},{54~58},{55~59},{56~60},{57~61},{58~62},{59~63},{60~64},{61~65},{62~66},{63~67},{64~68},{65~69},{66~70},{67~71},{68~72},{69~73},{70~74},{71~75},{72~76},{73~77},{74~78},{75~79},{76~80},{77~81},{78~82},{79~83},{80~84},{81~85},{82~86},{83~87},{84~88},{85~89},{86~90},{87~91},{88~92},{89~93},{90~94},{91~95},{92~96}	92
6	{1~6},{2~7},{3~8},{4~9},{5~10},{6~11},{7~12},{8~13},{9~14},{10~15},{11~16},{12~17},{13~18},{14~19},{15~20},{16~21},{17~22},{18~23},{19~24},{20~25},{21~26},{22~27},{23~28},{24~29},{25~30},{26~31},{27~32},{28~33},{29~34},{30~35},{31~36},{32~37},{33~38},{34~39},{35~40},{36~41},{37~42},{38~43},{39~44},{40~45},{41~46},{42~47},{43~48},{44~49},{45~50},{46~51},{47~52},{48~53},{49~54},{50~55},{51~56},{52~57},{53~58},{54~59},{55~60},{56~61},{57~62},{58~63},{59~64},{60~65},{61~66},{62~67},{63~68},{64~69},{65~70},{66~71},{67~72},{68~73},{69~74},{70~75},{71~76},{72~77},{73~78},{74~79},{75~80},{76~81},{77~82},{78~83},{79~84},{80~85},{81~86},{82~87},{83~88},{84~89},{85~90},{86~91},{87~92},{88~93},{89~94},{90~95},{91~96}	91
7	{1~7},{2~8},{3~9},{4~10},{5~11},{6~12},{7~13},{8~14},{9~15},{10~16},{11~17},{12~18},{13~19},{14~20},{15~21},{16~22},{17~23},{18~24},{19~25},{20~26},{21~27},{22~28},{23~29},{24~30},{25~31},{26~32},{27~33},{28~34},{29~35},{30~36},{31~37},{32~38},{33~39},{34~40},{35~41},{36~42},{37~43},{38~44},{39~45},{40~46},{41~47},{42~48},{43~49},{44~50},{45~51},{46~52},{47~53},{48~54},{49~55},{50~56},{51~57},{52~58},{53~59},{54~60},{55~61},{56~62},{57~63},{58~64},{59~65},{60~66},{61~67},{62~68},{63~69},{64~70},{65~71},{66~72},{67~73},{68~74},{69~75},{70~76},{71~77},{72~78},{73~79},{74~80},{75~81},{76~82},{77~83},{78~84},{79~85},{80~86},{81~87},{82~88},{83~89},{84~90},{85~91},{86~92},{87~93},{88~94},{89~95},{90~96}	90
8	{1~8},{2~9},{3~10},{4~11},{5~12},{6~13},{7~14},{8~15},{9~16},{10~17},{11~18},{12~19},{13~20},{14~21},{15~22},{16~23},{17~24},{18~25},{19~26},{20~27},{21~28},{22~29},{23~30},{24~31},{25~32},{26~33},{27~34},{28~35},{29~36},{30~37},{31~38},{32~39},{33~40},{34~41},{35~42},{36~43},{37~44},{38~45},{39~46},{40~47},{41~48},{42~49},{43~50},{44~51},{45~52},{46~53},{47~54},{48~55},{49~56},{50~57},{51~58},{52~59},{53~60},{54~61},{55~62},{56~63},{57~64},{58~65},{59~66},{60~67},{61~68},{62~69},{63~70},{64~71},{65~72},{66~73},{67~74},{68~75},{69~76},{70~77},{71~78},{72~79},{73~80},{74~81},{75~82},{76~83},{77~84},{78~85},{79~86},{80~87},{81~88},{82~89},{83~90},{84~91},{85~92},{86~93},{87~94},{88~95},{89~96}	89

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
9	{1~9},{2~10},{3~11},{4~12},{5~13},{6~14},{7~15},{8~16},{9~17},{10~18},{11~19},{12~20},{13~21},{14~22},{15~23},{16~24},{17~25},{18~26},{19~27},{20~28},{21~29},{22~30},{23~31},{24~32},{25~33},{26~34},{27~35},{28~36},{29~37},{30~38},{31~39},{32~40},{33~41},{34~42},{35~43},{36~44},{37~45},{38~46},{39~47},{40~48},{41~49},{42~50},{43~51},{44~52},{45~53},{46~54},{47~55},{48~56},{49~57},{50~58},{51~59},{52~60},{53~61},{54~62},{55~63},{56~64},{57~65},{58~66},{59~67},{60~68},{61~69},{62~70},{63~71},{64~72},{65~73},{66~74},{67~75},{68~76},{69~77},{70~78},{71~79},{72~80},{73~81},{74~82},{75~83},{76~84},{77~85},{78~86},{79~87},{80~88},{81~89},{82~90},{83~91},{84~92},{85~93},{86~94},{87~95},{88~96}	88
10	{1~10},{2~11},{3~12},{4~13},{5~14},{6~15},{7~16},{8~17},{9~18},{10~19},{11~20},{12~21},{13~22},{14~23},{15~24},{16~25},{17~26},{18~27},{19~28},{20~29},{21~30},{22~31},{23~32},{24~33},{25~34},{26~35},{27~36},{28~37},{29~38},{30~39},{31~40},{32~41},{33~42},{34~43},{35~44},{36~45},{37~46},{38~47},{39~48},{40~49},{41~50},{42~51},{43~52},{44~53},{45~54},{46~55},{47~56},{48~57},{49~58},{50~59},{51~60},{52~61},{53~62},{54~63},{55~64},{56~65},{57~66},{58~67},{59~68},{60~69},{61~70},{62~71},{63~72},{64~73},{65~74},{66~75},{67~76},{68~77},{69~78},{70~79},{71~80},{72~81},{73~82},{74~83},{75~84},{76~85},{77~86},{78~87},{79~88},{80~89},{81~90},{82~91},{83~92},{84~93},{85~94},{86~95},{87~96}	87
11	{1~11},{2~12},{3~13},{4~14},{5~15},{6~16},{7~17},{8~18},{9~19},{10~20},{11~21},{12~22},{13~23},{14~24},{15~25},{16~26},{17~27},{18~28},{19~29},{20~30},{21~31},{22~32},{23~33},{24~34},{25~35},{26~36},{27~37},{28~38},{29~39},{30~40},{31~41},{32~42},{33~43},{34~44},{35~45},{36~46},{37~47},{38~48},{39~49},{40~50},{41~51},{42~52},{43~53},{44~54},{45~55},{46~56},{47~57},{48~58},{49~59},{50~60},{51~61},{52~62},{53~63},{54~64},{55~65},{56~66},{57~67},{58~68},{59~69},{60~70},{61~71},{62~72},{63~73},{64~74},{65~75},{66~76},{67~77},{68~78},{69~79},{70~80},{71~81},{72~82},{73~83},{74~84},{75~85},{76~86},{77~87},{78~88},{79~89},{80~90},{81~91},{82~92},{83~93},{84~94},{85~95},{86~96}	86
12	{1~12},{2~13},{3~14},{4~15},{5~16},{6~17},{7~18},{8~19},{9~20},{10~21},{11~22},{12~23},{13~24},{14~25},{15~26},{16~27},{17~28},{18~29},{19~30},{20~31},{21~32},{22~33},{23~34},{24~35},{25~36},{26~37},{27~38},{28~39},{29~40},{30~41},{31~42},{32~43},{33~44},{34~45},{35~46},{36~47},{37~48},{38~49},{39~50},{40~51},{41~52},{42~53},{43~54},{44~55},{45~56},{46~57},{47~58},{48~59},{49~60},{50~61},{51~62},{52~63},{53~64},{54~65},{55~66},{56~67},{57~68},{58~69},{59~70},{60~71},{61~72},{62~73},{63~74},{64~75},{65~76},{66~77},{67~78},{68~79},{69~80},{70~81},{71~82},{72~83},{73~84},{74~85},{75~86},{76~87},{77~88},{78~89},{79~90},{80~91},{81~92},{82~93},{83~94},{84~95},{85~96}	85
13	{1~13},{4~16},{7~19},{10~22},{13~25},{16~28},{19~31},{22~34},{25~37},{28~40},{31~43},{34~46},{37~49},{40~52},{43~55},{46~58},{49~61},{52~64},{55~67},{58~70},{61~73},{64~76},{67~79},{70~82},{73~85},{76~88},{79~91},{82~94}	28
14	{1~14},{4~17},{7~20},{10~23},{13~26},{16~29},{19~32},{22~35},{25~38},{28~41},{31~44},{34~47},{37~50},{40~53},{43~56},{46~59},{49~62},{52~65},{55~68},{58~71},{61~74},{64~77},{67~80},{70~83},{73~86},{76~89},{79~92},{82~95}	28

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
15	{1~15},{4~18},{7~21},{10~24},{13~27},{16~30},{19~33},{22~36},{25~39},{28~42},{31~45},{34~48},{37~51},{40~54},{43~57},{46~60},{49~63},{52~66},{55~69},{58~72},{61~75},{64~78},{67~81},{70~84},{73~87},{76~90},{79~93},{82~96}	28
16	{1~16},{4~19},{7~22},{10~25},{13~28},{16~31},{19~34},{22~37},{25~40},{28~43},{31~46},{34~49},{37~52},{40~55},{43~58},{46~61},{49~64},{52~67},{55~70},{58~73},{61~76},{64~79},{67~82},{70~85},{73~88},{76~91},{79~94}	27
17	{1~17},{4~20},{7~23},{10~26},{13~29},{16~32},{19~35},{22~38},{25~41},{28~44},{31~47},{34~50},{37~53},{40~56},{43~59},{46~62},{49~65},{52~68},{55~71},{58~74},{61~77},{64~80},{67~83},{70~86},{73~89},{76~92},{79~95}	27
18	{1~18},{4~21},{7~24},{10~27},{13~30},{16~33},{19~36},{22~39},{25~42},{28~45},{31~48},{34~51},{37~54},{40~57},{43~60},{46~63},{49~66},{52~69},{55~72},{58~75},{61~78},{64~81},{67~84},{70~87},{73~90},{76~93},{79~96}	27
19	{1~19},{4~22},{7~25},{10~28},{13~31},{16~34},{19~37},{22~40},{25~43},{28~46},{31~49},{34~52},{37~55},{40~58},{43~61},{46~64},{49~67},{52~70},{55~73},{58~76},{61~79},{64~82},{67~85},{70~88},{73~91},{76~94}	26
20	{1~20},{4~23},{7~26},{10~29},{13~32},{16~35},{19~38},{22~41},{25~44},{28~47},{31~50},{34~53},{37~56},{40~59},{43~62},{46~65},{49~68},{52~71},{55~74},{58~77},{61~80},{64~83},{67~86},{70~89},{73~92},{76~95}	26
21	{1~21},{4~24},{7~27},{10~30},{13~33},{16~36},{19~39},{22~42},{25~45},{28~48},{31~51},{34~54},{37~57},{40~60},{43~63},{46~66},{49~69},{52~72},{55~75},{58~78},{61~81},{64~84},{67~87},{70~90},{73~93},{76~96}	26
22	{1~22},{4~25},{7~28},{10~31},{13~34},{16~37},{19~40},{22~43},{25~46},{28~49},{31~52},{34~55},{37~58},{40~61},{43~64},{46~67},{49~70},{52~73},{55~76},{58~79},{61~82},{64~85},{67~88},{70~91},{73~94}	25
23	{1~23},{4~26},{7~29},{10~32},{13~35},{16~38},{19~41},{22~44},{25~47},{28~50},{31~53},{34~56},{37~59},{40~62},{43~65},{46~68},{49~71},{52~74},{55~77},{58~80},{61~83},{64~86},{67~89},{70~92},{73~95}	25
24	{1~24},{4~27},{7~30},{10~33},{13~36},{16~39},{19~42},{22~45},{25~48},{28~51},{31~54},{34~57},{37~60},{40~63},{43~66},{46~69},{49~72},{52~75},{55~78},{58~81},{61~84},{64~87},{67~90},{70~93},{73~96}	25
25	{1~25},{5~29},{9~33},{13~37},{17~41},{21~45},{25~49},{29~53},{33~57},{37~61},{41~65},{45~69},{49~73},{53~77},{57~81},{61~85},{65~89},{69~93}	18
26	{1~26},{5~30},{9~34},{13~38},{17~42},{21~46},{25~50},{29~54},{33~58},{37~62},{41~66},{45~70},{49~74},{53~78},{57~82},{61~86},{65~90},{69~94}	18

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
27	{1~27},{5~31},{9~35},{13~39},{17~43},{21~47},{25~51},{29~55},{33~59},{37~63},{41~67},{45~71},{49~75},{53~79},{57~83},{61~87},{65~91},{69~95}	18
28	{1~28},{5~32},{9~36},{13~40},{17~44},{21~48},{25~52},{29~56},{33~60},{37~64},{41~68},{45~72},{49~76},{53~80},{57~84},{61~88},{65~92},{69~96}	18
29	{1~29},{5~33},{9~37},{13~41},{17~45},{21~49},{25~53},{29~57},{33~61},{37~65},{41~69},{45~73},{49~77},{53~81},{57~85},{61~89},{65~93}	17
30	{1~30},{5~34},{9~38},{13~42},{17~46},{21~50},{25~54},{29~58},{33~62},{37~66},{41~70},{45~74},{49~78},{53~82},{57~86},{61~90},{65~94}	17
31	{1~31},{5~35},{9~39},{13~43},{17~47},{21~51},{25~55},{29~59},{33~63},{37~67},{41~71},{45~75},{49~79},{53~83},{57~87},{61~91},{65~95}	17
32	{1~32},{5~36},{9~40},{13~44},{17~48},{21~52},{25~56},{29~60},{33~64},{37~68},{41~72},{45~76},{49~80},{53~84},{57~88},{61~92},{65~96}	17
33	{1~33},{5~37},{9~41},{13~45},{17~49},{21~53},{25~57},{29~61},{33~65},{37~69},{41~73},{45~77},{49~81},{53~85},{57~89},{61~93}	16
34	{1~34},{5~38},{9~42},{13~46},{17~50},{21~54},{25~58},{29~62},{33~66},{37~70},{41~74},{45~78},{49~82},{53~86},{57~90},{61~94}	16
35	{1~35},{5~39},{9~43},{13~47},{17~51},{21~55},{25~59},{29~63},{33~67},{37~71},{41~75},{45~79},{49~83},{53~87},{57~91},{61~95}	16
36	{1~36},{5~40},{9~44},{13~48},{17~52},{21~56},{25~60},{29~64},{33~68},{37~72},{41~76},{45~80},{49~84},{53~88},{57~92},{61~96}	16
37	{1~37},{5~41},{9~45},{13~49},{17~53},{21~57},{25~61},{29~65},{33~69},{37~73},{41~77},{45~81},{49~85},{53~89},{57~93}	15
38	{1~38},{5~42},{9~46},{13~50},{17~54},{21~58},{25~62},{29~66},{33~70},{37~74},{41~78},{45~82},{49~86},{53~90},{57~94}	15
39	{1~39},{5~43},{9~47},{13~51},{17~55},{21~59},{25~63},{29~67},{33~71},{37~75},{41~79},{45~83},{49~87},{53~91},{57~95}	15
40	{1~40},{5~44},{9~48},{13~52},{17~56},{21~60},{25~64},{29~68},{33~72},{37~76},{41~80},{45~84},{49~88},{53~92},{57~96}	15
41	{1~41},{5~45},{9~49},{13~53},{17~57},{21~61},{25~65},{29~69},{33~73},{37~77},{41~81},{45~85},{49~89},{53~93}	14
42	{1~42},{5~46},{9~50},{13~54},{17~58},{21~62},{25~66},{29~70},{33~74},{37~78},{41~82},{45~86},{49~90},{53~94}	14

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
43	{1~43},{5~47},{9~51},{13~55},{17~59},{21~63},{25~67},{29~71},{33~75},{37~79},{41~83},{45~87},{49~91},{53~95}	14
44	{1~44},{5~48},{9~52},{13~56},{17~60},{21~64},{25~68},{29~72},{33~76},{37~80},{41~84},{45~88},{49~92},{53~96}	14
45	{1~45},{5~49},{9~53},{13~57},{17~61},{21~65},{25~69},{29~73},{33~77},{37~81},{41~85},{45~89},{49~93}	13
46	{1~46},{5~50},{9~54},{13~58},{17~62},{21~66},{25~70},{29~74},{33~78},{37~82},{41~86},{45~90},{49~94}	13
47	{1~47},{5~51},{9~55},{13~59},{17~63},{21~67},{25~71},{29~75},{33~79},{37~83},{41~87},{45~91},{49~95}	13
48	{1~48},{5~52},{9~56},{13~60},{17~64},{21~68},{25~72},{29~76},{33~80},{37~84},{41~88},{45~92},{49~96}	13
49	{1~49},{5~53},{9~57},{13~61},{17~65},{21~69},{25~73},{29~77},{33~81},{37~85},{41~89},{45~93}	12
50	{1~50},{5~54},{9~58},{13~62},{17~66},{21~70},{25~74},{29~78},{33~82},{37~86},{41~90},{45~94}	12
51	{1~51},{5~55},{9~59},{13~63},{17~67},{21~71},{25~75},{29~79},{33~83},{37~87},{41~91},{45~95}	12
52	{1~52},{5~56},{9~60},{13~64},{17~68},{21~72},{25~76},{29~80},{33~84},{37~88},{41~92},{45~96}	12
53	{1~53},{5~57},{9~61},{13~65},{17~69},{21~73},{25~77},{29~81},{33~85},{37~89},{41~93}	11
54	{1~54},{5~58},{9~62},{13~66},{17~70},{21~74},{25~78},{29~82},{33~86},{37~90},{41~94}	11
55	{1~55},{5~59},{9~63},{13~67},{17~71},{21~75},{25~79},{29~83},{33~87},{37~91},{41~95}	11
56	{1~56},{5~60},{9~64},{13~68},{17~72},{21~76},{25~80},{29~84},{33~88},{37~92},{41~96}	11
57	{1~57},{5~61},{9~65},{13~69},{17~73},{21~77},{25~81},{29~85},{33~89},{37~93}	10
58	{1~58},{5~62},{9~66},{13~70},{17~74},{21~78},{25~82},{29~86},{33~90},{37~94}	10
59	{1~59},{5~63},{9~67},{13~71},{17~75},{21~79},{25~83},{29~87},{33~91},{37~95}	10

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
60	{1~60}, {5~64}, {9~68}, {13~72}, {17~76}, {21~80}, {25~84}, {29~88}, {33~92}, {37~96}	10
61	{1~61}, {5~65}, {9~69}, {13~73}, {17~77}, {21~81}, {25~85}, {29~89}, {33~93}	9
62	{1~62}, {5~66}, {9~70}, {13~74}, {17~78}, {21~82}, {25~86}, {29~90}, {33~94}	9
63	{1~63}, {5~67}, {9~71}, {13~75}, {17~79}, {21~83}, {25~87}, {29~91}, {33~95}	9
64	{1~64}, {5~68}, {9~72}, {13~76}, {17~80}, {21~84}, {25~88}, {29~92}, {33~96}	9
65	{1~65}, {5~69}, {9~73}, {13~77}, {17~81}, {21~85}, {25~89}, {29~93}	8
66	{1~66}, {5~70}, {9~74}, {13~78}, {17~82}, {21~86}, {25~90}, {29~94}	8
67	{1~67}, {5~71}, {9~75}, {13~79}, {17~83}, {21~87}, {25~91}, {29~95}	8
68	{1~68}, {5~72}, {9~76}, {13~80}, {17~84}, {21~88}, {25~92}, {29~96}	8
69	{1~69}, {5~73}, {9~77}, {13~81}, {17~85}, {21~89}, {25~93}	7
70	{1~70}, {5~74}, {9~78}, {13~82}, {17~86}, {21~90}, {25~94}	7
71	{1~71}, {5~75}, {9~79}, {13~83}, {17~87}, {21~91}, {25~95}	7
72	{1~72}, {5~76}, {9~80}, {13~84}, {17~88}, {21~92}, {25~96}	7
73	{1~73}, {5~77}, {9~81}, {13~85}, {17~89}, {21~93}	6
74	{1~74}, {5~78}, {9~82}, {13~86}, {17~90}, {21~94}	6
75	{1~75}, {5~79}, {9~83}, {13~87}, {17~91}, {21~95}	6
76	{1~76}, {5~80}, {9~84}, {13~88}, {17~92}, {21~96}	6
77	{20~96}	1
78	{19~96}	1
79	{18~96}	1
80	{17~96}	1
81	{16~96}	1
82	{15~96}	1
83	{14~96}	1

Assignable Resource Sizes	Contiguous LRUs Index	Number of Indices
84	{13~96}	1
85	{12~96}	1
86	{11~96}	1
87	{10~96}	1
88	{9~96}	1
89	{8~96}	1
90	{7~96}	1
91	{6~96}	1
92	{5~96}	1
93	{4~96}	1
94	{3~96}	1
95	{2~96}	1
96	{1~96}	1
		Total = 2048

[0070] Based on the defined selective locations L for certain allocation sizes as shown in Table 1, an example 11-bit **RI** index assignment may be generated as shown in Table 3.

TABLE 3

Index	Star t	Length	Index	Star t	Length	Index	Star t	Length	Index	Star t	Length
1	1	1	513	43	6	1025	24	12	1537	37	32
2	2	1	514	44	6	1026	25	12	1538	41	32
3	3	1	515	45	6	1027	26	12	1539	45	32
4	4	1	516	46	6	1028	27	12	1540	49	32

5	5	1	517	47	6	1029	28	12	1541	53	32
6	6	1	518	48	6	1030	29	12	1542	57	32
7	7	1	519	49	6	1031	30	12	1543	61	32
8	8	1	520	50	6	1032	31	12	1544	65	32
9	9	1	521	51	6	1033	32	12	1545	1	33
10	10	1	522	52	6	1034	33	12	1546	5	33
11	11	1	523	53	6	1035	34	12	1547	9	33
12	12	1	524	54	6	1036	35	12	1548	13	33
13	13	1	525	55	6	1037	36	12	1549	17	33
14	14	1	526	56	6	1038	37	12	1550	21	33
15	15	1	527	57	6	1039	38	12	1551	25	33
16	16	1	528	58	6	1040	39	12	1552	29	33
17	17	1	529	59	6	1041	40	12	1553	33	33
18	18	1	530	60	6	1042	41	12	1554	37	33
19	19	1	531	61	6	1043	42	12	1555	41	33
20	20	1	532	62	6	1044	43	12	1556	45	33
21	21	1	533	63	6	1045	44	12	1557	49	33
22	22	1	534	64	6	1046	45	12	1558	53	33
23	23	1	535	65	6	1047	46	12	1559	57	33
24	24	1	536	66	6	1048	47	12	1560	61	33
25	25	1	537	67	6	1049	48	12	1561	1	34
26	26	1	538	68	6	1050	49	12	1562	5	34
27	27	1	539	69	6	1051	50	12	1563	9	34
28	28	1	540	70	6	1052	51	12	1564	13	34
29	29	1	541	71	6	1053	52	12	1565	17	34
30	30	1	542	72	6	1054	53	12	1566	21	34
31	31	1	543	73	6	1055	54	12	1567	25	34
32	32	1	544	74	6	1056	55	12	1568	29	34
33	33	1	545	75	6	1057	56	12	1569	33	34
34	34	1	546	76	6	1058	57	12	1570	37	34
35	35	1	547	77	6	1059	58	12	1571	41	34
36	36	1	548	78	6	1060	59	12	1572	45	34
37	37	1	549	79	6	1061	60	12	1573	49	34
38	38	1	550	80	6	1062	61	12	1574	53	34
39	39	1	551	81	6	1063	62	12	1575	57	34
40	40	1	552	82	6	1064	63	12	1576	61	34
41	41	1	553	83	6	1065	64	12	1577	1	35
42	42	1	554	84	6	1066	65	12	1578	5	35
43	43	1	555	85	6	1067	66	12	1579	9	35
44	44	1	556	86	6	1068	67	12	1580	13	35

45	45	1	557	87	6	1069	68	12	1581	17	35
46	46	1	558	88	6	1070	69	12	1582	21	35
47	47	1	559	89	6	1071	70	12	1583	25	35
48	48	1	560	90	6	1072	71	12	1584	29	35
49	49	1	561	91	6	1073	72	12	1585	33	35
50	50	1	562	1	7	1074	73	12	1586	37	35
51	51	1	563	2	7	1075	74	12	1587	41	35
52	52	1	564	3	7	1076	75	12	1588	45	35
53	53	1	565	4	7	1077	76	12	1589	49	35
54	54	1	566	5	7	1078	77	12	1590	53	35
55	55	1	567	6	7	1079	78	12	1591	57	35
56	56	1	568	7	7	1080	79	12	1592	61	35
57	57	1	569	8	7	1081	80	12	1593	1	36
58	58	1	570	9	7	1082	81	12	1594	5	36
59	59	1	571	10	7	1083	82	12	1595	9	36
60	60	1	572	11	7	1084	83	12	1596	13	36
61	61	1	573	12	7	1085	84	12	1597	17	36
62	62	1	574	13	7	1086	85	12	1598	21	36
63	63	1	575	14	7	1087	1	13	1599	25	36
64	64	1	576	15	7	1088	4	13	1600	29	36
65	65	1	577	16	7	1089	7	13	1601	33	36
66	66	1	578	17	7	1090	10	13	1602	37	36
67	67	1	579	18	7	1091	13	13	1603	41	36
68	68	1	580	19	7	1092	16	13	1604	45	36
69	69	1	581	20	7	1093	19	13	1605	49	36
70	70	1	582	21	7	1094	22	13	1606	53	36
71	71	1	583	22	7	1095	25	13	1607	57	36
72	72	1	584	23	7	1096	28	13	1608	61	36
73	73	1	585	24	7	1097	31	13	1609	1	37
74	74	1	586	25	7	1098	34	13	1610	5	37
75	75	1	587	26	7	1099	37	13	1611	9	37
76	76	1	588	27	7	1100	40	13	1612	13	37
77	77	1	589	28	7	1101	43	13	1613	17	37
78	78	1	590	29	7	1102	46	13	1614	21	37
79	79	1	591	30	7	1103	49	13	1615	25	37
80	80	1	592	31	7	1104	52	13	1616	29	37
81	81	1	593	32	7	1105	55	13	1617	33	37
82	82	1	594	33	7	1106	58	13	1618	37	37
83	83	1	595	34	7	1107	61	13	1619	41	37
84	84	1	596	35	7	1108	64	13	1620	45	37

85	85	1	597	36	7	1109	67	13	1621	49	37
86	86	1	598	37	7	1110	70	13	1622	53	37
87	87	1	599	38	7	1111	73	13	1623	57	37
88	88	1	600	39	7	1112	76	13	1624	1	38
89	89	1	601	40	7	1113	79	13	1625	5	38
90	90	1	602	41	7	1114	82	13	1626	9	38
91	91	1	603	42	7	1115	1	14	1627	13	38
92	92	1	604	43	7	1116	4	14	1628	17	38
93	93	1	605	44	7	1117	7	14	1629	21	38
94	94	1	606	45	7	1118	10	14	1630	25	38
95	95	1	607	46	7	1119	13	14	1631	29	38
96	96	1	608	47	7	1120	16	14	1632	33	38
97	1	2	609	48	7	1121	19	14	1633	37	38
98	2	2	610	49	7	1122	22	14	1634	41	38
99	3	2	611	50	7	1123	25	14	1635	45	38
100	4	2	612	51	7	1124	28	14	1636	49	38
101	5	2	613	52	7	1125	31	14	1637	53	38
102	6	2	614	53	7	1126	34	14	1638	57	38
103	7	2	615	54	7	1127	37	14	1639	1	39
104	8	2	616	55	7	1128	40	14	1640	5	39
105	9	2	617	56	7	1129	43	14	1641	9	39
106	10	2	618	57	7	1130	46	14	1642	13	39
107	11	2	619	58	7	1131	49	14	1643	17	39
108	12	2	620	59	7	1132	52	14	1644	21	39
109	13	2	621	60	7	1133	55	14	1645	25	39
110	14	2	622	61	7	1134	58	14	1646	29	39
111	15	2	623	62	7	1135	61	14	1647	33	39
112	16	2	624	63	7	1136	64	14	1648	37	39
113	17	2	625	64	7	1137	67	14	1649	41	39
114	18	2	626	65	7	1138	70	14	1650	45	39
115	19	2	627	66	7	1139	73	14	1651	49	39
116	20	2	628	67	7	1140	76	14	1652	53	39
117	21	2	629	68	7	1141	79	14	1653	57	39
118	22	2	630	69	7	1142	82	14	1654	1	40
119	23	2	631	70	7	1143	1	15	1655	5	40
120	24	2	632	71	7	1144	4	15	1656	9	40
121	25	2	633	72	7	1145	7	15	1657	13	40
122	26	2	634	73	7	1146	10	15	1658	17	40
123	27	2	635	74	7	1147	13	15	1659	21	40
124	28	2	636	75	7	1148	16	15	1660	25	40

125	29	2	637	76	7	1149	19	15	1661	29	40
126	30	2	638	77	7	1150	22	15	1662	33	40
127	31	2	639	78	7	1151	25	15	1663	37	40
128	32	2	640	79	7	1152	28	15	1664	41	40
129	33	2	641	80	7	1153	31	15	1665	45	40
130	34	2	642	81	7	1154	34	15	1666	49	40
131	35	2	643	82	7	1155	37	15	1667	53	40
132	36	2	644	83	7	1156	40	15	1668	57	40
133	37	2	645	84	7	1157	43	15	1669	1	41
134	38	2	646	85	7	1158	46	15	1670	5	41
135	39	2	647	86	7	1159	49	15	1671	9	41
136	40	2	648	87	7	1160	52	15	1672	13	41
137	41	2	649	88	7	1161	55	15	1673	17	41
138	42	2	650	89	7	1162	58	15	1674	21	41
139	43	2	651	90	7	1163	61	15	1675	25	41
140	44	2	652	1	8	1164	64	15	1676	29	41
141	45	2	653	2	8	1165	67	15	1677	33	41
142	46	2	654	3	8	1166	70	15	1678	37	41
143	47	2	655	4	8	1167	73	15	1679	41	41
144	48	2	656	5	8	1168	76	15	1680	45	41
145	49	2	657	6	8	1169	79	15	1681	49	41
146	50	2	658	7	8	1170	82	15	1682	53	41
147	51	2	659	8	8	1171	1	16	1683	1	42
148	52	2	660	9	8	1172	4	16	1684	5	42
149	53	2	661	10	8	1173	7	16	1685	9	42
150	54	2	662	11	8	1174	10	16	1686	13	42
151	55	2	663	12	8	1175	13	16	1687	17	42
152	56	2	664	13	8	1176	16	16	1688	21	42
153	57	2	665	14	8	1177	19	16	1689	25	42
154	58	2	666	15	8	1178	22	16	1690	29	42
155	59	2	667	16	8	1179	25	16	1691	33	42
156	60	2	668	17	8	1180	28	16	1692	37	42
157	61	2	669	18	8	1181	31	16	1693	41	42
158	62	2	670	19	8	1182	34	16	1694	45	42
159	63	2	671	20	8	1183	37	16	1695	49	42
160	64	2	672	21	8	1184	40	16	1696	53	42
161	65	2	673	22	8	1185	43	16	1697	1	43
162	66	2	674	23	8	1186	46	16	1698	5	43
163	67	2	675	24	8	1187	49	16	1699	9	43
164	68	2	676	25	8	1188	52	16	1700	13	43

165	69	2	677	26	8	1189	55	16	1701	17	43
166	70	2	678	27	8	1190	58	16	1702	21	43
167	71	2	679	28	8	1191	61	16	1703	25	43
168	72	2	680	29	8	1192	64	16	1704	29	43
169	73	2	681	30	8	1193	67	16	1705	33	43
170	74	2	682	31	8	1194	70	16	1706	37	43
171	75	2	683	32	8	1195	73	16	1707	41	43
172	76	2	684	33	8	1196	76	16	1708	45	43
173	77	2	685	34	8	1197	79	16	1709	49	43
174	78	2	686	35	8	1198	1	17	1710	53	43
175	79	2	687	36	8	1199	4	17	1711	1	44
176	80	2	688	37	8	1200	7	17	1712	5	44
177	81	2	689	38	8	1201	10	17	1713	9	44
178	82	2	690	39	8	1202	13	17	1714	13	44
179	83	2	691	40	8	1203	16	17	1715	17	44
180	84	2	692	41	8	1204	19	17	1716	21	44
181	85	2	693	42	8	1205	22	17	1717	25	44
182	86	2	694	43	8	1206	25	17	1718	29	44
183	87	2	695	44	8	1207	28	17	1719	33	44
184	88	2	696	45	8	1208	31	17	1720	37	44
185	89	2	697	46	8	1209	34	17	1721	41	44
186	90	2	698	47	8	1210	37	17	1722	45	44
187	91	2	699	48	8	1211	40	17	1723	49	44
188	92	2	700	49	8	1212	43	17	1724	53	44
189	93	2	701	50	8	1213	46	17	1725	1	45
190	94	2	702	51	8	1214	49	17	1726	5	45
191	95	2	703	52	8	1215	52	17	1727	9	45
192	1	3	704	53	8	1216	55	17	1728	13	45
193	2	3	705	54	8	1217	58	17	1729	17	45
194	3	3	706	55	8	1218	61	17	1730	21	45
195	4	3	707	56	8	1219	64	17	1731	25	45
196	5	3	708	57	8	1220	67	17	1732	29	45
197	6	3	709	58	8	1221	70	17	1733	33	45
198	7	3	710	59	8	1222	73	17	1734	37	45
199	8	3	711	60	8	1223	76	17	1735	41	45
200	9	3	712	61	8	1224	79	17	1736	45	45
201	10	3	713	62	8	1225	1	18	1737	49	45
202	11	3	714	63	8	1226	4	18	1738	1	46
203	12	3	715	64	8	1227	7	18	1739	5	46
204	13	3	716	65	8	1228	10	18	1740	9	46

205	14	3	717	66	8	1229	13	18	1741	13	46
206	15	3	718	67	8	1230	16	18	1742	17	46
207	16	3	719	68	8	1231	19	18	1743	21	46
208	17	3	720	69	8	1232	22	18	1744	25	46
209	18	3	721	70	8	1233	25	18	1745	29	46
210	19	3	722	71	8	1234	28	18	1746	33	46
211	20	3	723	72	8	1235	31	18	1747	37	46
212	21	3	724	73	8	1236	34	18	1748	41	46
213	22	3	725	74	8	1237	37	18	1749	45	46
214	23	3	726	75	8	1238	40	18	1750	49	46
215	24	3	727	76	8	1239	43	18	1751	1	47
216	25	3	728	77	8	1240	46	18	1752	5	47
217	26	3	729	78	8	1241	49	18	1753	9	47
218	27	3	730	79	8	1242	52	18	1754	13	47
219	28	3	731	80	8	1243	55	18	1755	17	47
220	29	3	732	81	8	1244	58	18	1756	21	47
221	30	3	733	82	8	1245	61	18	1757	25	47
222	31	3	734	83	8	1246	64	18	1758	29	47
223	32	3	735	84	8	1247	67	18	1759	33	47
224	33	3	736	85	8	1248	70	18	1760	37	47
225	34	3	737	86	8	1249	73	18	1761	41	47
226	35	3	738	87	8	1250	76	18	1762	45	47
227	36	3	739	88	8	1251	79	18	1763	49	47
228	37	3	740	89	8	1252	1	19	1764	1	48
229	38	3	741	1	9	1253	4	19	1765	5	48
230	39	3	742	2	9	1254	7	19	1766	9	48
231	40	3	743	3	9	1255	10	19	1767	13	48
232	41	3	744	4	9	1256	13	19	1768	17	48
233	42	3	745	5	9	1257	16	19	1769	21	48
234	43	3	746	6	9	1258	19	19	1770	25	48
235	44	3	747	7	9	1259	22	19	1771	29	48
236	45	3	748	8	9	1260	25	19	1772	33	48
237	46	3	749	9	9	1261	28	19	1773	37	48
238	47	3	750	10	9	1262	31	19	1774	41	48
239	48	3	751	11	9	1263	34	19	1775	45	48
240	49	3	752	12	9	1264	37	19	1776	49	48
241	50	3	753	13	9	1265	40	19	1777	1	49
242	51	3	754	14	9	1266	43	19	1778	5	49
243	52	3	755	15	9	1267	46	19	1779	9	49
244	53	3	756	16	9	1268	49	19	1780	13	49

245	54	3	757	17	9	1269	52	19	1781	17	49
246	55	3	758	18	9	1270	55	19	1782	21	49
247	56	3	759	19	9	1271	58	19	1783	25	49
248	57	3	760	20	9	1272	61	19	1784	29	49
249	58	3	761	21	9	1273	64	19	1785	33	49
250	59	3	762	22	9	1274	67	19	1786	37	49
251	60	3	763	23	9	1275	70	19	1787	41	49
252	61	3	764	24	9	1276	73	19	1788	45	49
253	62	3	765	25	9	1277	76	19	1789	1	50
254	63	3	766	26	9	1278	1	20	1790	5	50
255	64	3	767	27	9	1279	4	20	1791	9	50
256	65	3	768	28	9	1280	7	20	1792	13	50
257	66	3	769	29	9	1281	10	20	1793	17	50
258	67	3	770	30	9	1282	13	20	1794	21	50
259	68	3	771	31	9	1283	16	20	1795	25	50
260	69	3	772	32	9	1284	19	20	1796	29	50
261	70	3	773	33	9	1285	22	20	1797	33	50
262	71	3	774	34	9	1286	25	20	1798	37	50
263	72	3	775	35	9	1287	28	20	1799	41	50
264	73	3	776	36	9	1288	31	20	1800	45	50
265	74	3	777	37	9	1289	34	20	1801	1	51
266	75	3	778	38	9	1290	37	20	1802	5	51
267	76	3	779	39	9	1291	40	20	1803	9	51
268	77	3	780	40	9	1292	43	20	1804	13	51
269	78	3	781	41	9	1293	46	20	1805	17	51
270	79	3	782	42	9	1294	49	20	1806	21	51
271	80	3	783	43	9	1295	52	20	1807	25	51
272	81	3	784	44	9	1296	55	20	1808	29	51
273	82	3	785	45	9	1297	58	20	1809	33	51
274	83	3	786	46	9	1298	61	20	1810	37	51
275	84	3	787	47	9	1299	64	20	1811	41	51
276	85	3	788	48	9	1300	67	20	1812	45	51
277	86	3	789	49	9	1301	70	20	1813	1	52
278	87	3	790	50	9	1302	73	20	1814	5	52
279	88	3	791	51	9	1303	76	20	1815	9	52
280	89	3	792	52	9	1304	1	21	1816	13	52
281	90	3	793	53	9	1305	4	21	1817	17	52
282	91	3	794	54	9	1306	7	21	1818	21	52
283	92	3	795	55	9	1307	10	21	1819	25	52
284	93	3	796	56	9	1308	13	21	1820	29	52

285	94	3	797	57	9	1309	16	21	1821	33	52
286	1	4	798	58	9	1310	19	21	1822	37	52
287	2	4	799	59	9	1311	22	21	1823	41	52
288	3	4	800	60	9	1312	25	21	1824	45	52
289	4	4	801	61	9	1313	28	21	1825	1	53
290	5	4	802	62	9	1314	31	21	1826	5	53
291	6	4	803	63	9	1315	34	21	1827	9	53
292	7	4	804	64	9	1316	37	21	1828	13	53
293	8	4	805	65	9	1317	40	21	1829	17	53
294	9	4	806	66	9	1318	43	21	1830	21	53
295	10	4	807	67	9	1319	46	21	1831	25	53
296	11	4	808	68	9	1320	49	21	1832	29	53
297	12	4	809	69	9	1321	52	21	1833	33	53
298	13	4	810	70	9	1322	55	21	1834	37	53
299	14	4	811	71	9	1323	58	21	1835	41	53
300	15	4	812	72	9	1324	61	21	1836	1	54
301	16	4	813	73	9	1325	64	21	1837	5	54
302	17	4	814	74	9	1326	67	21	1838	9	54
303	18	4	815	75	9	1327	70	21	1839	13	54
304	19	4	816	76	9	1328	73	21	1840	17	54
305	20	4	817	77	9	1329	76	21	1841	21	54
306	21	4	818	78	9	1330	1	22	1842	25	54
307	22	4	819	79	9	1331	4	22	1843	29	54
308	23	4	820	80	9	1332	7	22	1844	33	54
309	24	4	821	81	9	1333	10	22	1845	37	54
310	25	4	822	82	9	1334	13	22	1846	41	54
311	26	4	823	83	9	1335	16	22	1847	1	55
312	27	4	824	84	9	1336	19	22	1848	5	55
313	28	4	825	85	9	1337	22	22	1849	9	55
314	29	4	826	86	9	1338	25	22	1850	13	55
315	30	4	827	87	9	1339	28	22	1851	17	55
316	31	4	828	88	9	1340	31	22	1852	21	55
317	32	4	829	1	10	1341	34	22	1853	25	55
318	33	4	830	2	10	1342	37	22	1854	29	55
319	34	4	831	3	10	1343	40	22	1855	33	55
320	35	4	832	4	10	1344	43	22	1856	37	55
321	36	4	833	5	10	1345	46	22	1857	41	55
322	37	4	834	6	10	1346	49	22	1858	1	56
323	38	4	835	7	10	1347	52	22	1859	5	56
324	39	4	836	8	10	1348	55	22	1860	9	56

325	40	4	837	9	10	1349	58	22	1861	13	56
326	41	4	838	10	10	1350	61	22	1862	17	56
327	42	4	839	11	10	1351	64	22	1863	21	56
328	43	4	840	12	10	1352	67	22	1864	25	56
329	44	4	841	13	10	1353	70	22	1865	29	56
330	45	4	842	14	10	1354	73	22	1866	33	56
331	46	4	843	15	10	1355	1	23	1867	37	56
332	47	4	844	16	10	1356	4	23	1868	41	56
333	48	4	845	17	10	1357	7	23	1869	1	57
334	49	4	846	18	10	1358	10	23	1870	5	57
335	50	4	847	19	10	1359	13	23	1871	9	57
336	51	4	848	20	10	1360	16	23	1872	13	57
337	52	4	849	21	10	1361	19	23	1873	17	57
338	53	4	850	22	10	1362	22	23	1874	21	57
339	54	4	851	23	10	1363	25	23	1875	25	57
340	55	4	852	24	10	1364	28	23	1876	29	57
341	56	4	853	25	10	1365	31	23	1877	33	57
342	57	4	854	26	10	1366	34	23	1878	37	57
343	58	4	855	27	10	1367	37	23	1879	1	58
344	59	4	856	28	10	1368	40	23	1880	5	58
345	60	4	857	29	10	1369	43	23	1881	9	58
346	61	4	858	30	10	1370	46	23	1882	13	58
347	62	4	859	31	10	1371	49	23	1883	17	58
348	63	4	860	32	10	1372	52	23	1884	21	58
349	64	4	861	33	10	1373	55	23	1885	25	58
350	65	4	862	34	10	1374	58	23	1886	29	58
351	66	4	863	35	10	1375	61	23	1887	33	58
352	67	4	864	36	10	1376	64	23	1888	37	58
353	68	4	865	37	10	1377	67	23	1889	1	59
354	69	4	866	38	10	1378	70	23	1890	5	59
355	70	4	867	39	10	1379	73	23	1891	9	59
356	71	4	868	40	10	1380	1	24	1892	13	59
357	72	4	869	41	10	1381	4	24	1893	17	59
358	73	4	870	42	10	1382	7	24	1894	21	59
359	74	4	871	43	10	1383	10	24	1895	25	59
360	75	4	872	44	10	1384	13	24	1896	29	59
361	76	4	873	45	10	1385	16	24	1897	33	59
362	77	4	874	46	10	1386	19	24	1898	37	59
363	78	4	875	47	10	1387	22	24	1899	1	60
364	79	4	876	48	10	1388	25	24	1900	5	60

365	80	4	877	49	10	1389	28	24	1901	9	60
366	81	4	878	50	10	1390	31	24	1902	13	60
367	82	4	879	51	10	1391	34	24	1903	17	60
368	83	4	880	52	10	1392	37	24	1904	21	60
369	84	4	881	53	10	1393	40	24	1905	25	60
370	85	4	882	54	10	1394	43	24	1906	29	60
371	86	4	883	55	10	1395	46	24	1907	33	60
372	87	4	884	56	10	1396	49	24	1908	37	60
373	88	4	885	57	10	1397	52	24	1909	1	61
374	89	4	886	58	10	1398	55	24	1910	5	61
375	90	4	887	59	10	1399	58	24	1911	9	61
376	91	4	888	60	10	1400	61	24	1912	13	61
377	92	4	889	61	10	1401	64	24	1913	17	61
378	93	4	890	62	10	1402	67	24	1914	21	61
379	1	5	891	63	10	1403	70	24	1915	25	61
380	2	5	892	64	10	1404	73	24	1916	29	61
381	3	5	893	65	10	1405	1	25	1917	33	61
382	4	5	894	66	10	1406	5	25	1918	1	62
383	5	5	895	67	10	1407	9	25	1919	5	62
384	6	5	896	68	10	1408	13	25	1920	9	62
385	7	5	897	69	10	1409	17	25	1921	13	62
386	8	5	898	70	10	1410	21	25	1922	17	62
387	9	5	899	71	10	1411	25	25	1923	21	62
388	10	5	900	72	10	1412	29	25	1924	25	62
389	11	5	901	73	10	1413	33	25	1925	29	62
390	12	5	902	74	10	1414	37	25	1926	33	62
391	13	5	903	75	10	1415	41	25	1927	1	63
392	14	5	904	76	10	1416	45	25	1928	5	63
393	15	5	905	77	10	1417	49	25	1929	9	63
394	16	5	906	78	10	1418	53	25	1930	13	63
395	17	5	907	79	10	1419	57	25	1931	17	63
396	18	5	908	80	10	1420	61	25	1932	21	63
397	19	5	909	81	10	1421	65	25	1933	25	63
398	20	5	910	82	10	1422	69	25	1934	29	63
399	21	5	911	83	10	1423	1	26	1935	33	63
400	22	5	912	84	10	1424	5	26	1936	1	64
401	23	5	913	85	10	1425	9	26	1937	5	64
402	24	5	914	86	10	1426	13	26	1938	9	64
403	25	5	915	87	10	1427	17	26	1939	13	64
404	26	5	916	1	11	1428	21	26	1940	17	64

405	27	5	917	2	11	1429	25	26	1941	21	64
406	28	5	918	3	11	1430	29	26	1942	25	64
407	29	5	919	4	11	1431	33	26	1943	29	64
408	30	5	920	5	11	1432	37	26	1944	33	64
409	31	5	921	6	11	1433	41	26	1945	1	65
410	32	5	922	7	11	1434	45	26	1946	5	65
411	33	5	923	8	11	1435	49	26	1947	9	65
412	34	5	924	9	11	1436	53	26	1948	13	65
413	35	5	925	10	11	1437	57	26	1949	17	65
414	36	5	926	11	11	1438	61	26	1950	21	65
415	37	5	927	12	11	1439	65	26	1951	25	65
416	38	5	928	13	11	1440	69	26	1952	29	65
417	39	5	929	14	11	1441	1	27	1953	1	66
418	40	5	930	15	11	1442	5	27	1954	5	66
419	41	5	931	16	11	1443	9	27	1955	9	66
420	42	5	932	17	11	1444	13	27	1956	13	66
421	43	5	933	18	11	1445	17	27	1957	17	66
422	44	5	934	19	11	1446	21	27	1958	21	66
423	45	5	935	20	11	1447	25	27	1959	25	66
424	46	5	936	21	11	1448	29	27	1960	29	66
425	47	5	937	22	11	1449	33	27	1961	1	67
426	48	5	938	23	11	1450	37	27	1962	5	67
427	49	5	939	24	11	1451	41	27	1963	9	67
428	50	5	940	25	11	1452	45	27	1964	13	67
429	51	5	941	26	11	1453	49	27	1965	17	67
430	52	5	942	27	11	1454	53	27	1966	21	67
431	53	5	943	28	11	1455	57	27	1967	25	67
432	54	5	944	29	11	1456	61	27	1968	29	67
433	55	5	945	30	11	1457	65	27	1969	1	68
434	56	5	946	31	11	1458	69	27	1970	5	68
435	57	5	947	32	11	1459	1	28	1971	9	68
436	58	5	948	33	11	1460	5	28	1972	13	68
437	59	5	949	34	11	1461	9	28	1973	17	68
438	60	5	950	35	11	1462	13	28	1974	21	68
439	61	5	951	36	11	1463	17	28	1975	25	68
440	62	5	952	37	11	1464	21	28	1976	29	68
441	63	5	953	38	11	1465	25	28	1977	1	69
442	64	5	954	39	11	1466	29	28	1978	5	69
443	65	5	955	40	11	1467	33	28	1979	9	69
444	66	5	956	41	11	1468	37	28	1980	13	69

445	67	5	957	42	11	1469	41	28	1981	17	69
446	68	5	958	43	11	1470	45	28	1982	21	69
447	69	5	959	44	11	1471	49	28	1983	25	69
448	70	5	960	45	11	1472	53	28	1984	1	70
449	71	5	961	46	11	1473	57	28	1985	5	70
450	72	5	962	47	11	1474	61	28	1986	9	70
451	73	5	963	48	11	1475	65	28	1987	13	70
452	74	5	964	49	11	1476	69	28	1988	17	70
453	75	5	965	50	11	1477	1	29	1989	21	70
454	76	5	966	51	11	1478	5	29	1990	25	70
455	77	5	967	52	11	1479	9	29	1991	1	71
456	78	5	968	53	11	1480	13	29	1992	5	71
457	79	5	969	54	11	1481	17	29	1993	9	71
458	80	5	970	55	11	1482	21	29	1994	13	71
459	81	5	971	56	11	1483	25	29	1995	17	71
460	82	5	972	57	11	1484	29	29	1996	21	71
461	83	5	973	58	11	1485	33	29	1997	25	71
462	84	5	974	59	11	1486	37	29	1998	1	72
463	85	5	975	60	11	1487	41	29	1999	5	72
464	86	5	976	61	11	1488	45	29	2000	9	72
465	87	5	977	62	11	1489	49	29	2001	13	72
466	88	5	978	63	11	1490	53	29	2002	17	72
467	89	5	979	64	11	1491	57	29	2003	21	72
468	90	5	980	65	11	1492	61	29	2004	25	72
469	91	5	981	66	11	1493	65	29	2005	1	73
470	92	5	982	67	11	1494	1	30	2006	5	73
471	1	6	983	68	11	1495	5	30	2007	9	73
472	2	6	984	69	11	1496	9	30	2008	13	73
473	3	6	985	70	11	1497	13	30	2009	17	73
474	4	6	986	71	11	1498	17	30	2010	21	73
475	5	6	987	72	11	1499	21	30	2011	1	74
476	6	6	988	73	11	1500	25	30	2012	5	74
477	7	6	989	74	11	1501	29	30	2013	9	74
478	8	6	990	75	11	1502	33	30	2014	13	74
479	9	6	991	76	11	1503	37	30	2015	17	74
480	10	6	992	77	11	1504	41	30	2016	21	74
481	11	6	993	78	11	1505	45	30	2017	1	75
482	12	6	994	79	11	1506	49	30	2018	5	75
483	13	6	995	80	11	1507	53	30	2019	9	75
484	14	6	996	81	11	1508	57	30	2020	13	75

485	15	6	997	82	11	1509	61	30	2021	17	75
486	16	6	998	83	11	1510	65	30	2022	21	75
487	17	6	999	84	11	1511	1	31	2023	1	76
488	18	6	1000	85	11	1512	5	31	2024	5	76
489	19	6	1001	86	11	1513	9	31	2025	9	76
490	20	6	1002	1	12	1514	13	31	2026	13	76
491	21	6	1003	2	12	1515	17	31	2027	17	76
492	22	6	1004	3	12	1516	21	31	2028	21	76
493	23	6	1005	4	12	1517	25	31	2029	20	77
494	24	6	1006	5	12	1518	29	31	2030	19	78
495	25	6	1007	6	12	1519	33	31	2031	18	79
496	26	6	1008	7	12	1520	37	31	2032	17	80
497	27	6	1009	8	12	1521	41	31	2033	16	81
498	28	6	1010	9	12	1522	45	31	2034	15	82
499	29	6	1011	10	12	1523	49	31	2035	14	83
500	30	6	1012	11	12	1524	53	31	2036	13	84
501	31	6	1013	12	12	1525	57	31	2037	12	85
502	32	6	1014	13	12	1526	61	31	2038	11	86
503	33	6	1015	14	12	1527	65	31	2039	10	87
504	34	6	1016	15	12	1528	1	32	2040	9	88
505	35	6	1017	16	12	1529	5	32	2041	8	89
506	36	6	1018	17	12	1530	9	32	2042	7	90
507	37	6	1019	18	12	1531	13	32	2043	6	91
508	38	6	1020	19	12	1532	17	32	2044	5	92
509	39	6	1021	20	12	1533	21	32	2045	4	93
510	40	6	1022	21	12	1534	25	32	2046	3	94
511	41	6	1023	22	12	1535	29	32	2047	2	95
512	42	6	1024	23	12	1536	33	32	2048	1	96

[0071] Other variations of limiting the starting position or combinations of limiting the starting position and the size may be used to reduce the number of required signaling bits to indicate an index value, such as shown in Table 3.

[0072] An alternative method for resource allocation using A-MAP IEs relates to maximum allocation size (AS). The AS may be defined as follows:

$$AS = S * STC_rate * TTI_length \quad (Equation 1)$$

where S is the number of LRUs derived from the RI field in the A-MAP IEs, STC_rate represents the space time coding (STC) rate allocated to the burst, and TTI_Length represents a length in subframes for the burst. The maximum AS value may be determined by multiple constraints. For example, a maximum value of AS may be defined as 192, and for a specific WTRU 102, a maximum allowable STC_rate is negotiated as a basic capability parameter during network entry. The maximum value of AS may not be larger than the multiple of the max allowable STC_rate for the MS and the number of LRUs in a subframe. Thus, the maximum value of AS and a given STC_rate and TTI_length may be used to derive the value range of S , in order to narrow down the valid combinations of size S and location L for the RI to be signaled in the A-MAP IEs.

[0073] An alternative method for allocation resources using A-MAP IE includes defining the size of the RI field in the assignment A-MAP IEs so that additional allocations may be specified. For example, a 12-bit RI field may be defined by using the 1-bit reserved field in the current downlink/uplink Basic Assignment A-MAP IEs. Alternatively, a 13-bit RI field may be defined by using the 1-bit reserved field and a 1-bit that is released from redefined other fields in the current Basic Assignment IEs (e.g., change the size of parameter fields of MIMO encodings from 5 bits to 4 bits).

[0074] With the 12-bit RI re-design, there is no impact on other information fields in the current downlink/uplink Basic assignment A-MAP IEs, as it uses the currently reserved 1-bit. A 12-bit RI field gives 4096 indexes to identify different combinations of allocation locations and sizes. The total number of all combinations of allocation locations and sizes in a 20MHz system is 4656 (i.e., still 560 more than what a 12-bit RI field can specify). Any of the above methods, either alone or in combination, may be used to resolve this RI index shortage (e.g., eliminating those invalid location/size combinations by taking advantage of

the frequency partitions and/or LRU types; and/or eliminating those invalid location/size combinations by considering the LRUs occupied by control channels; and/or reducing the number of assignable locations and/or assignable sizes).

[0075] For example, the RI field can be extended from 11 bits to 12 bits by using the currently reserved bit in the basic assignment A-MAP IEs, and the remaining reduction of RI field indexes can be achieved by disregarding the information of control channel resource occupancy to reduce the number of allocations that may be signaled in the assignment IEs. The control channel allocation reduction may be selectively used only when needed or may be applied to all cases. The 12-bit RI field from the current 11-bit RI plus 1 reserved bit may have no impact on any other info fields in the current assignment IEs. As previously described, the consideration of control channel resource occupancy reduces the number of allocations that may be signaled in the assignment A-MAP IEs. For example, in a 20MHz channel bandwidth, if 6 LRUs are used for control channels in a subframe, then 4095 allocations may be needed to be signaled, which may be accommodated by the 12-bit RI field.

[0076] With the 13-bit RI re-design scheme, all the 4656 possible combinations of allocation locations and sizes may be identified. However, impact on other information fields in the current downlink/uplink Basic Assignment A-MAP IEs cannot be avoided, as one more bit may be released from another information field, in addition to using the currently reserved one bit. In order to minimize the impact on design of other information fields, one information field may be designed to release one bit. For example, the MIMO related information fields in the downlink/uplink Basic Assignment IEs may be candidates to be re-designed so that one bit may be released.

[0077] An alternative method for resource allocation using the A-MAP IEs, is to define the mapping according to discrete (i.e., non-contiguous) LRUs.

Currently, the downlink/uplink basic assignment resource allocation consists of a set of contiguous LRUs in a subframe. However, allowing allocations with discrete LRUs may be desirable in some cases (e.g., diversity gain, and/or filling holes). Additionally, by allowing allocations with discrete LRUs, more valid allocations may become available to be signaled in the A-MAP IEs, thus making it even more challenging to design the A-MAP IEs with a very strict limitation on its size (e.g., 40 bits as in current specifications).

[0078] Several mechanisms may be used to support the allocations with discrete LRUs including: a) selectively choosing the allocations with discrete LRUs (i.e., not allowing all possible discrete ones); b) grouping LRUs (e.g., for subband LRUs), using the subband grouping mechanism (i.e., 4 LRUs per subband); c) using bitmaps to signal the inclusion of LRUs or groups of LRU in an allocation; or d) using the RI tables to define the allowed allocations, including allocations with contiguous LRUs and allocations with discrete LRUs. For example, when applying the constraint of the same LRU type and same frequency partition for allocations, the number of valid allocations may be significantly reduced, which may leave many of RI code points unused. In this case, the unused RI code points may be used to signal allocations with discrete LRUs.

[0079] EMBODIMENTS

[0080] 1. A method for resource allocation in assignment information elements (IEs), the method comprising:

[0081] defining a sets of selective starting locations (L) and allocation sizes (S) in combinations (L,S) for resource allocations, based on a predetermined total number of available logical resource units (LRUs) and valid resource allocations; and

[0082] defining a mapping of a resource index to each combination (L,S), wherein the location size S is a number of LRUs.

[0083] 2. The method as in embodiment 1, further comprising defining the valid resource allocations.

[0084] 3. The method as in embodiments 1-2, further comprising defining the mapping between the resource allocations and a resource index (RI) as an information field in resource assignment information elements (IEs).

[0085] 4. The method as in embodiments 1-3, wherein a valid resource allocation is an allocated set of LRUs (Logical Resource Units) are contained within a same frequency partition.

[0086] 5. The method as in embodiments 1-4, wherein a valid resource allocation is an allocated set of LRUs are of the same type of LRUs, e.g., DRU (Distributed Resource Unit), NLRU (Miniband LRU), or SLRU (Subband LRU).

[0087] 6. The method as in embodiments 1-5, wherein a valid resource allocation is a set of allocated LRUs not occupied by pre-defined control channels.

[0088] 7. The method as in embodiments 1-6, wherein the starting locations L are selectively defined by fixed gaps between the (L,S) combinations.

[0089] 8. A base station (BS) that allocations resources comprising:

[0090] a processor that:

[0091] defines sets of selective starting locations (L) and allocation sizes (S) in combinations (L,S) for resource allocations, based on a predetermined total number of available logical resource units (LRUs) and valid resource allocations; and

[0092] defines a mapping of a resource index to each combination (L,S), wherein the location size S is a number of LRUs.

[0093] 9. The BS of embodiment 8, wherein the processor also defines the valid resource allocations.

[0094] 10. The BS of embodiment 8, wherein the processor also defines a mapping between the resource allocations and a resource index (RI) as an information field in resource assignment information elements (IEs).

[0095] 11. The BS of embodiment 9, wherein a valid resource allocation is an allocated set of LRUs (Logical Resource Units) contained within a same frequency partition.

[0096] 12. The BS of embodiment 9, wherein a valid resource allocation is an allocated set of LRUs are of the same type of LRUs, e.g., DRU (Distributed Resource Unit), NLRU (Miniband LRU), or SLRU (Subband LRU).

[0097] 13. The BS of embodiment 9, wherein a valid resource allocation is a set of allocated LRUs not occupied by pre-defined control channels.

[0098] Although features and elements are described above in particular combinations, one of ordinary skill in the art will appreciate that each feature or element can be used alone or in any combination with the other features and elements. In addition, the methods described herein may be implemented in a computer program, software, or firmware incorporated in a computer-readable medium for execution by a computer or processor. Examples of computer-readable media include electronic signals (transmitted over wired or wireless connections) and computer-readable storage media. Examples of computer-readable storage media include, but are not limited to, a read only memory (ROM), a random access memory (RAM), a register, cache memory, semiconductor memory devices, magnetic media such as internal hard disks and removable disks, magneto-optical media, and optical media such as CD-ROM disks, and digital versatile disks (DVDs). A processor in association with software may be used to implement a radio frequency transceiver for use in a WTRU, UE, terminal, base station, RNC, or any host computer.

*

*

*

CLAIMS

What is claimed is:

1. A method for resource allocation in assignment of information elements (IEs), the method comprising:

defining sets of selective starting locations (L) and allocation sizes (S) in combinations (L,S) for resource allocations, based on a predetermined total number of available logical resource units (LRUs) and valid resource allocations; and

defining a mapping of a resource index to each combination (L,S), wherein the location size S is a number of LRUs.

2. The method of claim 1, further comprising defining the valid resource allocations.

3. The method of claim 1, further comprising defining the mapping between the resource allocations and a resource index (RI) as an information field in resource assignment information elements (IEs).

4. The method of claim 2, wherein a valid resource allocation is an allocated set of LRUs (Logical Resource Units) contained within a same frequency partition.

5. The method of claim 2, wherein a valid resource allocation is an allocated set of LRUs are of the same type of LRUs, e.g., DRU (Distributed Resource Unit), NLRU (Miniband LRU), or SLRU (Subband LRU).

6. The method of claim 2, wherein a valid resource allocation is a set of allocated LRUs not occupied by pre-defined control channels.

7. The method of claim 1, wherein the starting locations L are selectively defined by fixed gaps between the (L,S) combinations.

8. A base station (BS) that allocations resources comprising:
a processor that:
defines sets of selective starting locations (L) and allocation sizes (S) in combinations (L,S) for resource allocations, based on a predetermined total number of available logical resource units (LRUs) and valid resource allocations; and
defines a mapping of a resource index to each combination (L,S), wherein the location size S is a number of LRUs.

9. The BS of claim 8, wherein the processor also defines the valid resource allocations.

10. The BS of claim 8, wherein the processor also defines a mapping between the resource allocations and a resource index (RI) as an information field in resource assignment information elements (IEs).

11. The BS of claim 9, wherein a valid resource allocation is an allocated set of LRUs (Logical Resource Units) contained within a same frequency partition.

12. The BS of claim 9, wherein a valid resource allocation is an allocated set of LRUs are of the same type of LRUs, e.g., DRU (Distributed Resource Unit), NLRU (Miniband LRU), or SLRU (Subband LRU).

13. The BS of claim 9, wherein a valid resource allocation is a set of allocated LRUs not occupied by pre-defined control channels.

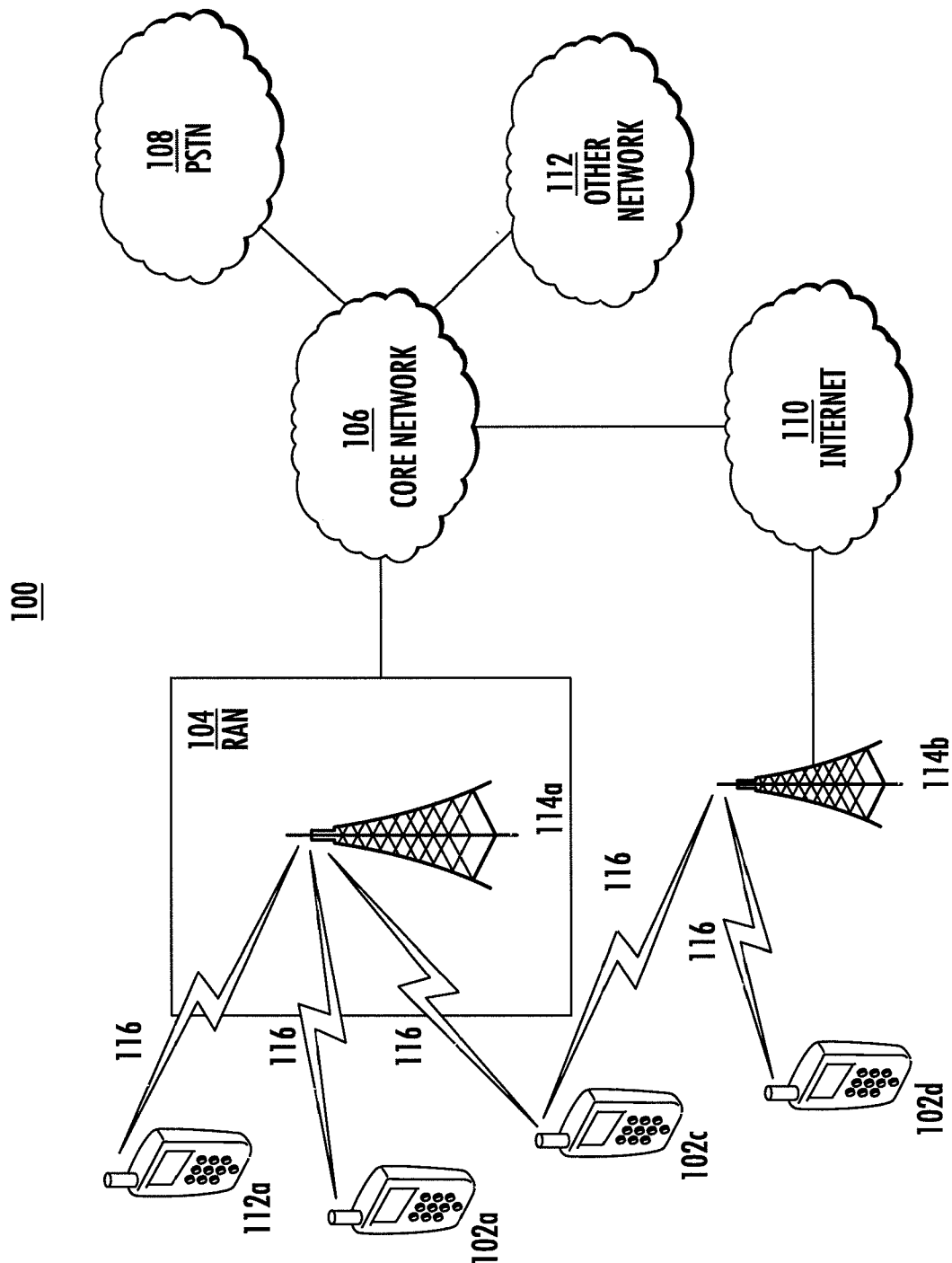
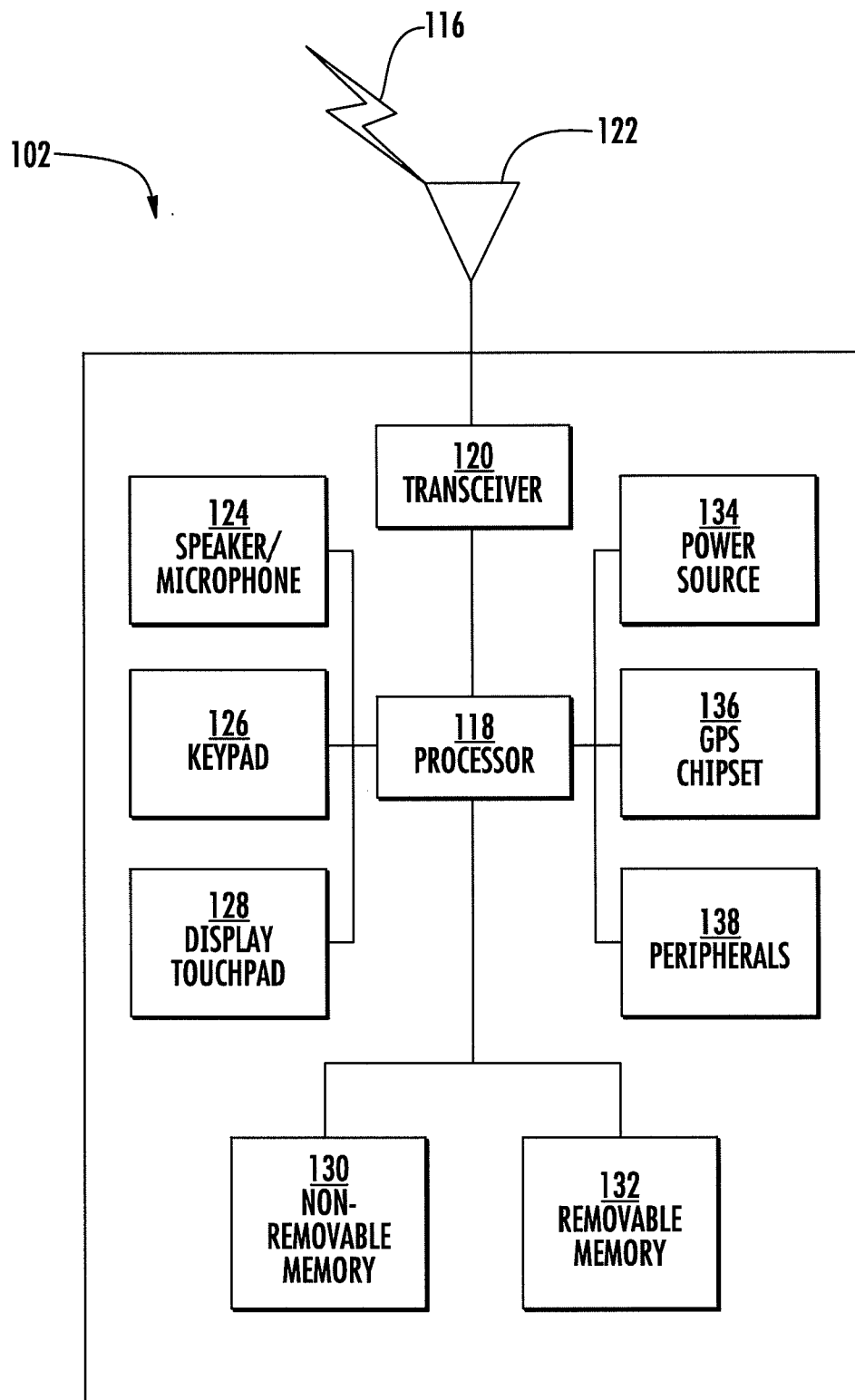


FIG. 1A

2/6

**FIG. 1B**

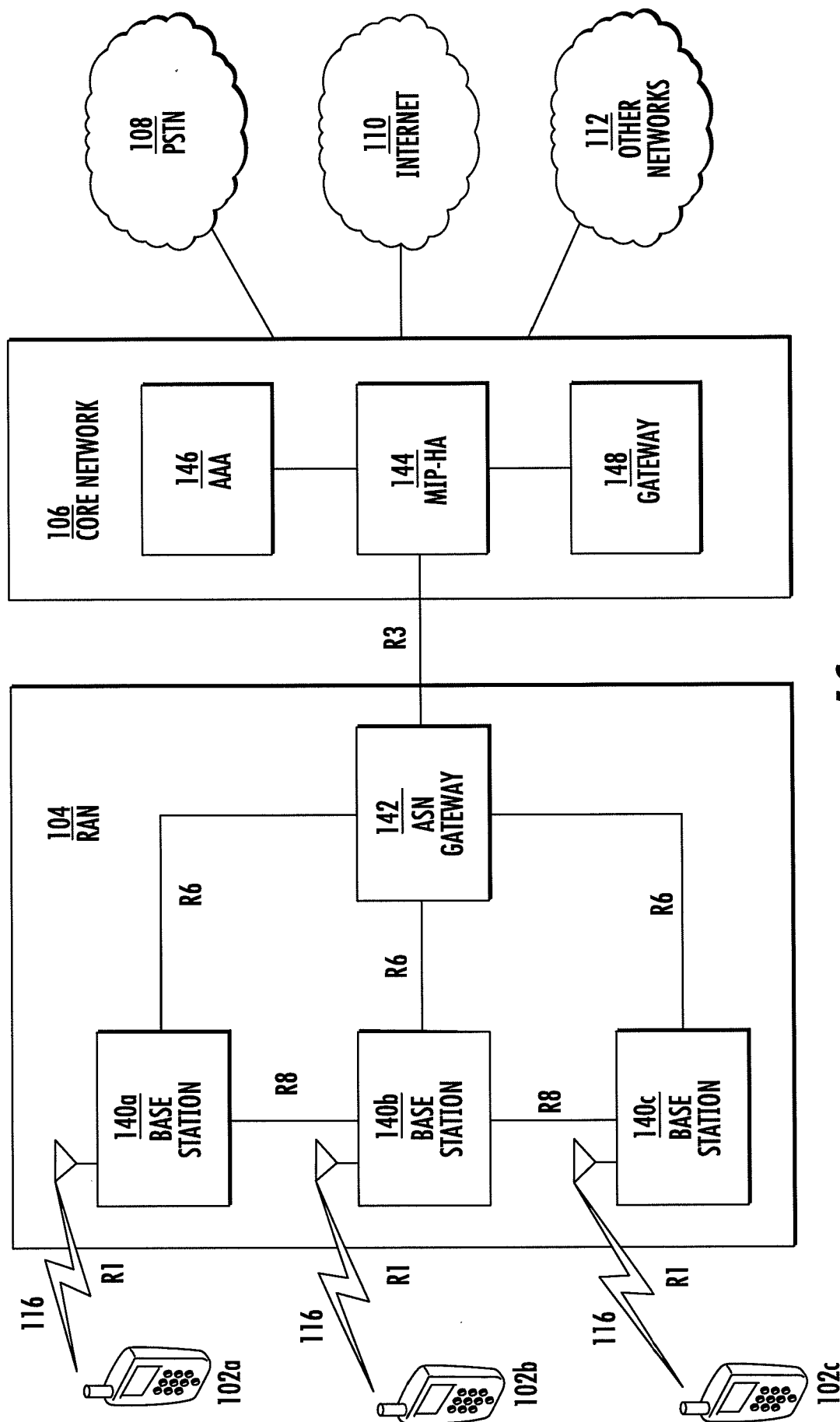
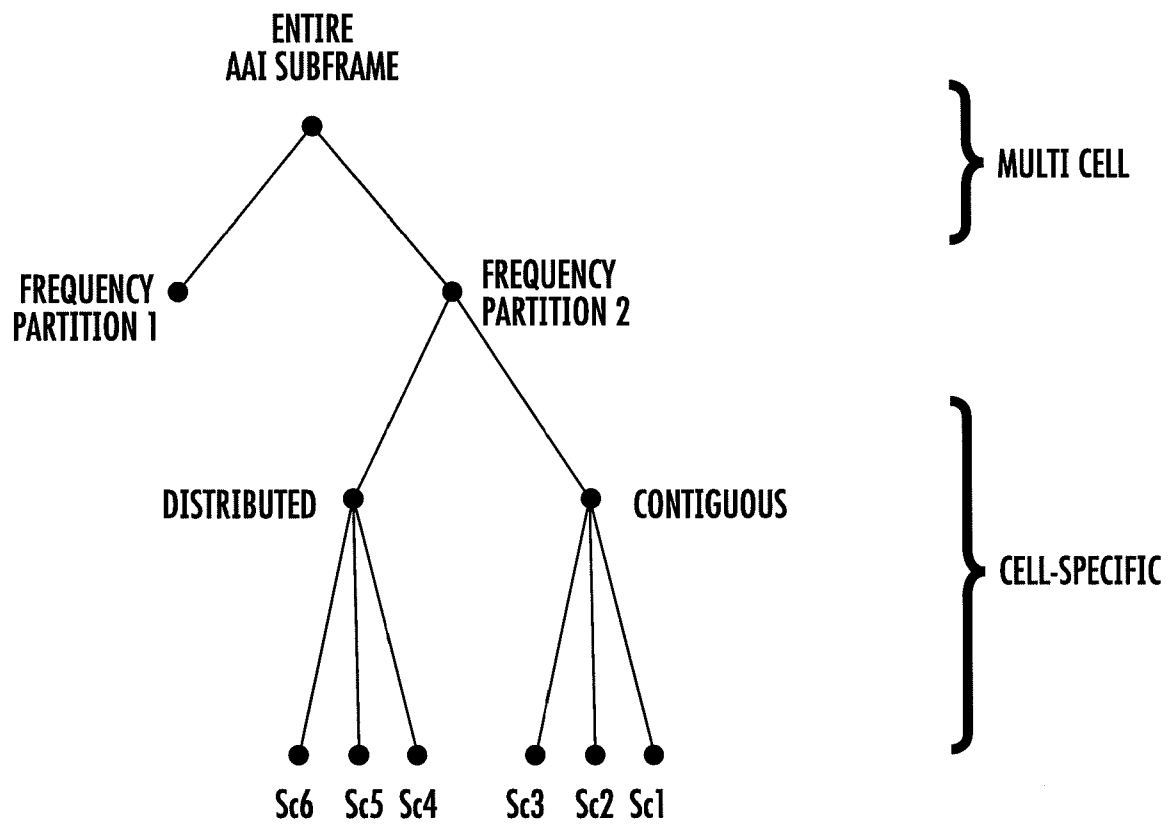
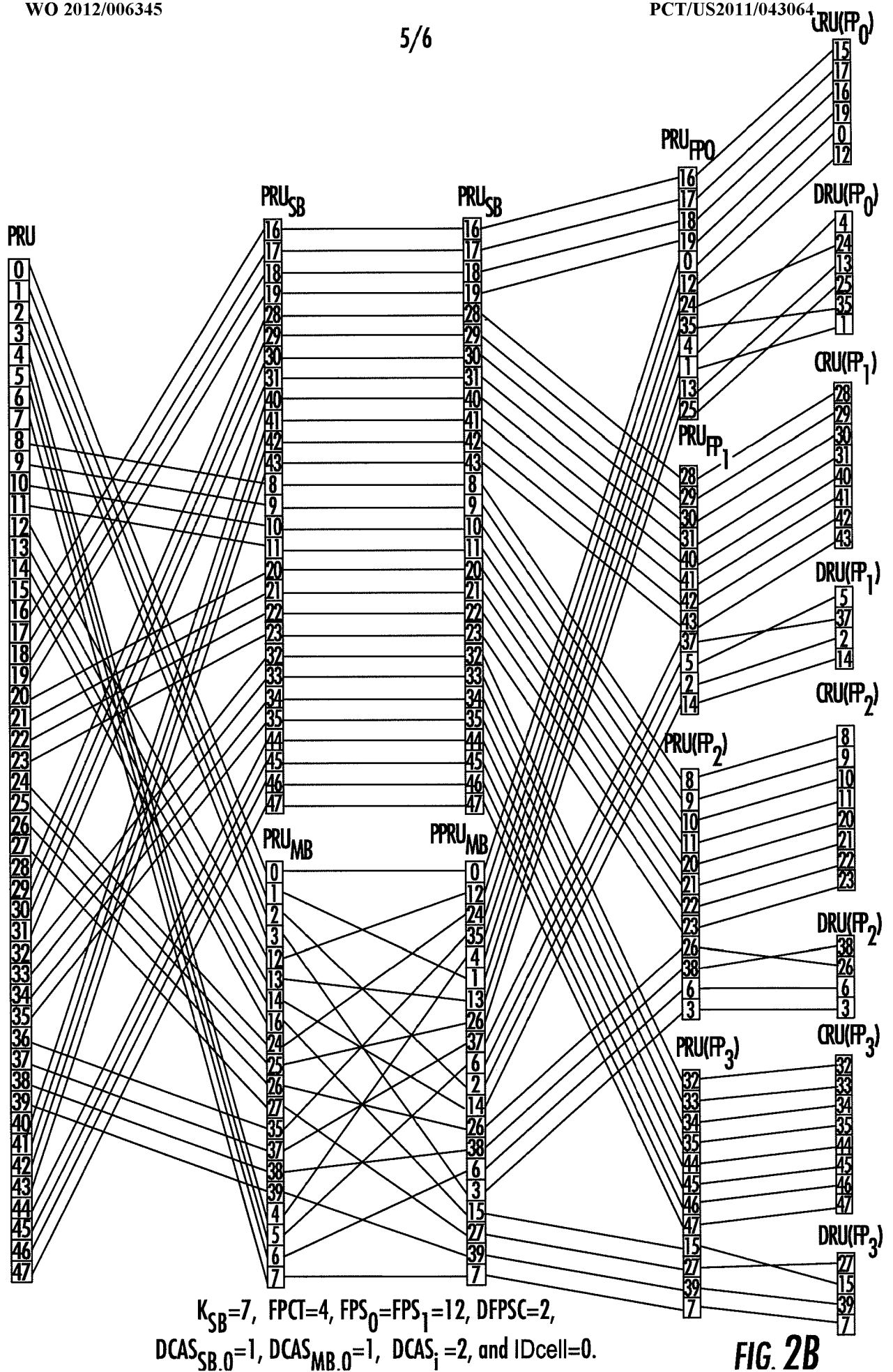


FIG. 1C

**FIG. 2A**



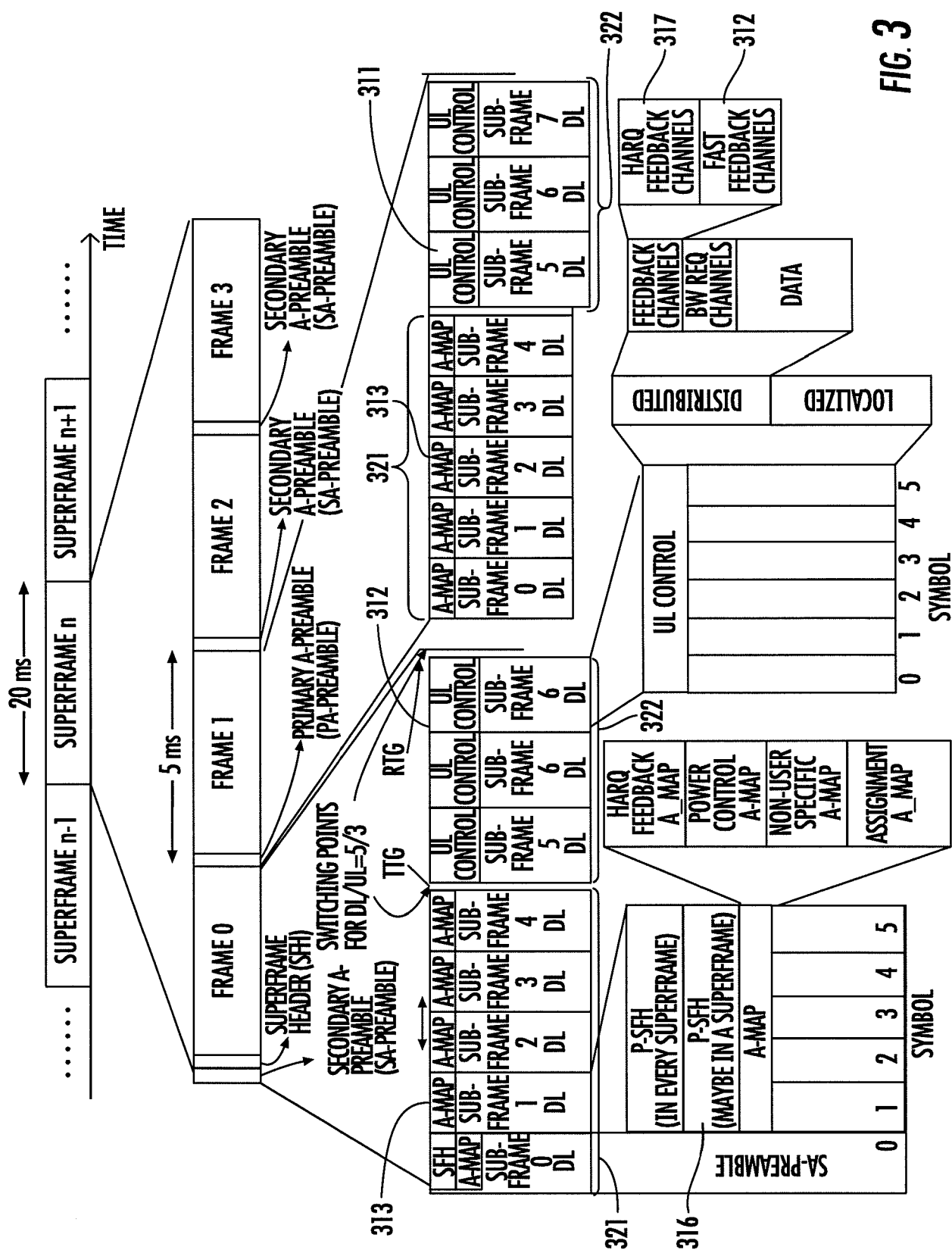


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/043064

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L5/00

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	wo 2010/049217 AI (NOKIA SI EMENS NETWORKS OY [FI] ; BOARIU ADRIAN [US] ; MAHESHWARI SHASHI K) 6 May 2010 (2010-05-06) abstract; figures 3-9 , 13 paragraph [0036] - paragraph [0040] paragraph [0043] paragraph [0045] - paragraph [0048] paragraph [0073] - paragraph [0077] ----- -/- .	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

20 October 2011

Date of mailing of the international search report

28/10/2011

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Haas , Hans

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/043064

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	BACIOCCOLA A ET AL: "IEEE 802.16: History, status and future trends", COMPUTER COMMUNICATIONS, ELSEVIER SCIENCE PUBLISHERS BV, AMSTERDAM, NL, vol. 33, no. 2, 15 February 2010 (2010-02-15), pages 113-123, XP026819383, ISSN: 0140-3664 [retrieved on 2009-11-10] abstract; figures 7, 10 page 121, column 1, line 13 - page 122, column 1, line 27 -----	1-13
A	AHMADI S: "An overview of next-generation mobile WiMAX technology", IEEE COMMUNICATIONS MAGAZINE, IEEE SERVICE CENTER, PISCATAWAY, US, vol. 47, no. 6, 1 June 2009 (2009-06-01), pages 84-98, XP011281828, ISSN: 0163-6804, DOI: 10.1109/MCOM.2009.5116805 abstract; figure 3 page 91, column 2, line 1 - page 92, column 1, line 25 page 93, column 1, line 5 - column 2, line 12 -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/043064

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010049217	06-05-2010	EP 2363007 A1	07-09-2011
		US 2011249644 A1	13-10-2011
