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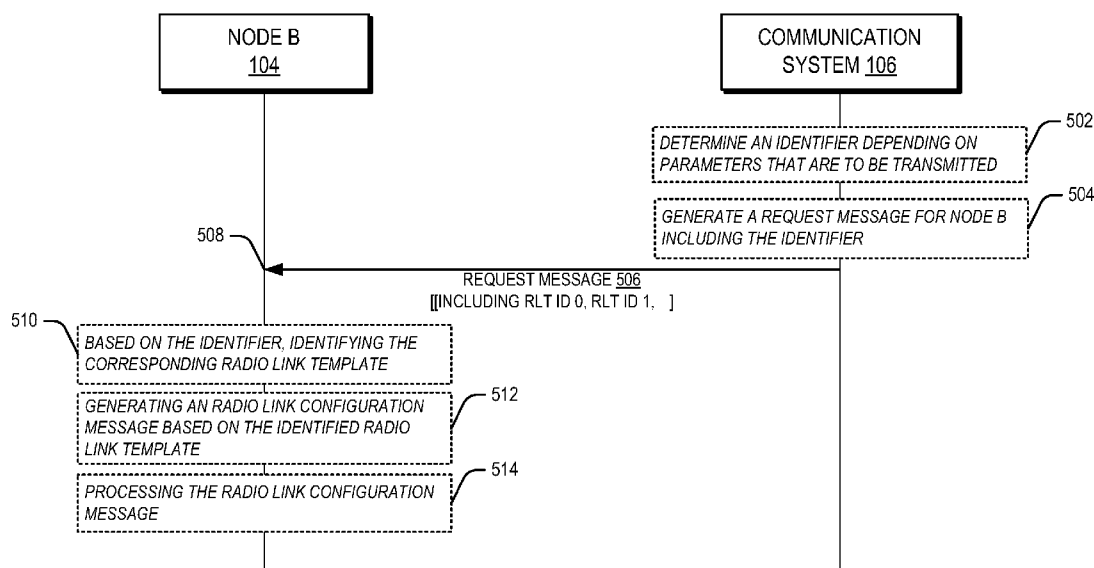


FIG. 5

(57) Abstract: Approaches for performing one or more radio link-related operations are described. In one example, a communication system comprises a radio link manager. The radio link manager determines an identifier based on a radio link-related operation to be performed for a radio link between a Node B and a user equipment within a telecommunication network. Thereafter, the radio link manager generates a request message, wherein the request message includes the determined identifier. In one example, the identifier corresponds to a radio link template, with the radio link template including one or more link-related parameters.

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RADIO LINK TEMPLATES

TECHNICAL FIELD

5 [0001] Various examples for managing a radio link between systems of a mobile communication system are described.

BACKGROUND

10 [0002] In the context of a Universal Mobile Telecommunications System (UMTS) based architecture, a mobile communication network generally includes a user equipment (UE) which communicates with a UMTS Terrestrial Radio Access Network (UTRAN) in order to connect to a core network. The UTRAN in turn, may further include other components, such as a Node B and a Radio Network Controller (RNC). Within the UTRAN, the RNC controls the functionalities and operations of the Node B. To such an end, the RNC and the Node B communicate with each other through signalling protocols, 15 such as the Node B Application Part (NBAP) signalling protocol. Depending on certain conditions, such as change in radio channel conditions or number of UEs which may be present within the network, the radio link may be managed. For example, either a radio link has to be established between the Node B and one or more UEs, or that an existing radio link has to be reconfigured to handle an increase in number of UEs attempting to 20 communicate to the Node B. Accordingly, the RNC may share certain radio link-related parameters with the Node B, based on which the radio link may be set-up or may be reconfigured in accordance with such parameters. Such examples may be implemented, although with slight modifications, in other communication networks as well.

BRIEF DESCRIPTION OF THE DRAWINGS

25 [0003] The following detailed description references the drawings, wherein:

[0004] FIG. 1 is a block diagram of an example mobile communication network with a communication system for managing a radio link;

30 [0005] FIG. 2 is a block diagram of an example communication system for generating a radio link template for managing a radio link;

[0006] FIG. 3 is a block diagram of an example Node B for managing a radio link based on radio link template;

[0007] FIGS. 4-5 are example call-flow diagrams depicting various functionalities of an example communication system and an example Node B for managing a radio link based

on radio link templates;

[0008] FIG. 6 is a flowchart depicting an example method for managing radio link by an example Node B based on an example radio link template;

[0009] FIG. 7 is a flowchart of another example method for managing a radio link based on an example radio link template; and

[0010] FIG. 8 is a block diagram of an example networked environment implementing a non-transitory computer-readable medium, for causing an example communication system for managing a radio link based on an example radio link template.

DETAILED DESCRIPTION

[0011] Universal Mobile Telecommunications System (UMTS) is a third-generation mobile cellular system for mobile communication networks based on the Global System for Mobile (GSM) communications standards. The UMTS architecture implements communication between number of mobile phones (referred to as user equipment or UEs) through a core network. The UEs in turn connect with the core network through UTRAN. The UTRAN also includes a number of telecommunication components, namely, the RNC and one or more Node B, which are in communication with the RNC. The RNC implements certain core functionalities of the mobile communication network and manages all the Node Bs which may be present within the UTRAN.

[0012] The RNC may periodically transmit one or more control signals and parameters to the Node B. Such parameters are generally utilized for managing the radio link between the Node B and the one or more UEs that may be in communication with the aforesaid Node B. As would be generally understood, the Node B may include one or more transceiver elements which enable the Node B to wirelessly communicate with the UEs. As would be generally understood, the number of UEs which are connected with the Node B may vary depending on the number of mobile phone subscribers located in physical proximity with and are being serviced by the Node B. As mentioned previously, depending on condition of certain network conditions, such as change in the radio channel conditions, the radio link may be managed. For example, either a radio link may be set-up, i.e., established between the Node B and one or more UEs, or that an existing radio link may be reconfigured to handle an increase in number of UEs attempting to communicate to the Node B.

[0013] The setting up of the radio link is affected by the RNC through one or more parameters which may be shared with the Node B through various signalling protocols.

With respect to the UMTS-based architecture, the signalling may be implemented through the NBAP protocol as defined in 3GPP TS 25.433 standard. For setting up the radio link, the RNC may specify a variety of different radio link-based parameters. These parameters form the basis on which a radio link may be eventually established between the Node B and the UEs. The parameters may be broadly categorized as identities, user-specific parameters and a common set of parameters. Examples of identity parameters may include, but are not limited to, user ID and transaction ID. User-specific parameters on the other hand may include parameters that are dynamically calculated and assigned and based on network-based factors, such as the network conditions, and may include scrambling/channelization code, HARQ allocation, frame/chip offsets. The common set of parameters which are typically configured with the same value for different UEs, and hence is common or similar across for different UEs.

[0014] Prior to setting-up a radio link, the radio link-based parameters are shared with the Node B. The Node B may process the radio link-based parameters based on which the radio link may eventually be set-up. In a similar manner, whenever a radio link has to be reconfigured, the RNC may share the appropriate radio link-based parameters with the Node B, based on which the Node B may reconfigure the radio link with the UEs. It may be noted that the number of parameters within the common set of parameters may be extensive.

[0015] In certain instances, it may be possible that the number of UEs within a certain area may increase dramatically. For example, during mass events a large gathering of individuals may assemble at a location, as a result of which either the radio link may be set-up or repeatedly reconfigured between the UEs and the Node B. In such circumstances, the common set of parameters would be continuously exchanged between the RNC and the Node B. Since the number of parameters within the common set of parameters may be extensive, it may correspondingly result in an increased overhead in the NBAP signalling between the Node B and the RNC. Such an increased overhead may tend to have an impact on the quality of communication between the different UEs.

[0016] Approaches for performing a radio link-related operation for a radio link with a Node B within a mobile communication network, are described. In one example, the radio link-related operation is performed based on one or more radio link templates. Examples of such radio link-related operations include, but are not limited to, setting-up a radio link or reconfiguring an existing radio link. Performing the radio link-related

operations based on radio link templates results in a decrease in the number of parameters that are exchanged with the Node B and a communication system, which controls and manages such Node B. As a result, the overhead between the Node B and such a communication system reduces considerably within the mobile communication network (hereinafter referred to as the “communication network”).

[0017] The radio link templates may be generated based on a number of radio link-based parameters. To that end, a number of radio link-based parameters may be initially selected. The radio link-based parameters may be such that the most commonly used parameters for certain users, may be initially selected. Once the parameters are selected, a radio link template may be generated and associated with a unique identifier. The radio link template thus generated may include the one or more radio link-based parameters. In a similar manner, other radio link templates associated with respective unique identifiers may be further generated based on either the same or a different set of radio link-based parameters for different subscriber. Once generated, the radio link templates are transmitted to a Node B. The Node B on receiving the radio link templates stores the same for later access.

[0018] In operation, the communication system may determine whether the radio link is to be established, or whether the same has to be set-up in case no radio link exists. Depending on whether a radio link is to be set-up or reconfigured, a request message is generated and transmitted to the Node B. The generated request message is such that it includes the unique identifiers of the radio link templates corresponding to the radio link-based parameters which would have been utilized for managing the radio link. Once the request message is received by the Node B, the unique identifiers included in the request message are determined. Based on the determined unique identifiers, the appropriate radio link template stored within the Node B is retrieved. The radio link-based parameters corresponding to the retrieved radio link template are obtained. The Node B may then process the radio link-based parameters for managing the radio link, i.e., for either setting-up a radio link or for reconfiguring an existing radio link.

[0019] As would be noted, the request message transmitted to the Node B includes one or more unique identifiers corresponding to the radio link templates that may be stored within the Node B. Based on the unique identifiers, the Node B is able to retrieve the appropriate radio link template and accordingly manage the radio link based on the radio link template. Since the request message does not include the extensive set

of common radio link-based parameters, the resulting overhead in the signalling between the communication system and the Node B is less, even during mass events or during high load cases. Furthermore, since the radio link-based parameters are not to be transmitted when the radio link is to be managed, i.e., either set-up or reconfigured, additional capacity may be available which may be used for implementing other features within the communication network. In one example, the radio link templates and the request message incorporating the unique identifier of the radio link templates may be generated by a communication system, present within the communication network. In another example, the communication system may include an RNC. It is pertinent to note that the examples provided in the foregoing and described in conjunction with the figures are provided with respect to UMTS based architecture. This is intended for sake of explanation only and may be one of the many other possible examples. It may be noted that such examples may also be applicable without deviating from the scope of the accompanying claims. Although the present examples have been described with respect to radio link-related operations involving either setting up a radio link or reconfiguring an already existing radio link, other radio link-related operations may include other activities pertaining to radio link. To such an extent, reference to managing a radio link are to be construed broadly and should not be limited to the examples as described herein.

[0020] The manner in which the above-mentioned examples are implemented has been explained in detail with respect to FIGS. 1-8. While aspects of the present subject matter may be implemented in a variety of different communication systems, transmission environments, and/or configurations, the implementations are described in the context of the following system(s) as examples.

[0021] The words during, while, and when as used herein are not exact terms that mean an action takes place instantly upon an initiating action but that there may be some small but reasonable delay, such as a propagation delay, between the initial action and the reaction that is initiated by the initial action. Additionally, the words “connected” and “coupled” are used throughout for clarity of the description and can include either a direct connection or an indirect connection. Various examples of the present subject matter have been described below by referring to several examples.

[0022] FIG. 1 illustrates a communication network 100 for performing radio link-related operations and for managing a radio link based on radio link template, as per one example. It may be noted that the present example implementation is being

described in the context of UMTS based architecture. The present example is only one example - other examples in the context of any other architecture would also be covered within the scope of the accompanying claims. Such other examples should not be construed as limiting the scope of the claimed subject matter.

5 **[0023]** Returning to the present example, the communication network 100 comprises a plurality of user equipment (UE) 102-1,..., 102-N (collectively referred to as UE 102). The UE 102 is in communication with Node B 104-1 through Uu radio interface. The Node B 104-1 in turn is in communication with communication system 106. The Node B 104-1 and the communication system 106 are part of the UTRAN
10 108. The UTRAN 108 may further include additional Node Bs, namely, Node B 104-N. For the purposes of the present description, the different Node B 104-1,..., 104-N are referred to as a Node B 104. A reference to Node B 104 may include reference to a single Node B or to multiple Node Bs within the UTRAN 108. The communication system 106 connects to the core network 110 for implementing the mobile-based
15 communication through the UE 102. In one example, the communication system 106 is a radio network controller (RNC).

[0024] Initially, the communication system 106 may determine one or more radio link-based parameters. In one example, the radio link-based parameters may be considered as parameters based on which the Node B 104, based on control
20 instructions received from the communication system 106, is able to manage the radio link with one or more UEs 102. To that end, in certain circumstances, radio link between the Node B 104 and UE 102 may be set-up or, in case of existing radio links, the same may be reconfigured. In either case, the setting up or reconfiguration of the radio links may be affected based on the radio link-based parameters.

25 **[0025]** Once the radio link-based parameters are determined, the communication system 106 may generate one or more radio link templates. The radio link templates are such that they include the radio link-based parameters which may be utilized for managing radio link with the UEs 102. Each of the radio link template is associated with a unique identifier. The radio link templates may then be shared with the Node B
30 104 which stores it for subsequent processing.

[0026] It may be the case that the communication system 106, based one or more measurement reports from the UEs 102, determines whether a radio link-related operation (e.g., setting-up a radio link or reconfiguring an existing radio link) pertaining to the radio link between the Node B 104 and the UEs 102 has to be performed. On

determining that the radio link has to be managed, the communication system 106 may generate a request message. The request message, thus generated, incorporates the unique identifiers of one or more radio link templates. The request message bearing the one or more unique identifiers are transmitted to the Node B 104.

5 [0027] Once received, the Node B 104 may process the received request message to retrieve the radio link templates from amongst the stored radio link templates based on the unique identifier. In one example, the retrieved radio link templates may then be further processed to identify the corresponding radio link-based parameters that were included therein. Based on the radio link-based parameters, the Node B 104 may
10 generate an internal configuration message. The internal configuration message may then be utilized by the Node B 104 for managing the radio link, i.e., for either setting up a radio link or reconfiguring an existing radio link. In this manner, the radio link may be managed based on the unique identifiers provided in the request message without exchanging the radio link-based parameters. In another example, the received request
15 message may be provided to the lower layered components present within the Node B 104. In such cases, the lower layered components may obtain the radio link templates. The lower layered components may further determine the link-related parameters based on which, it may generate internal configuration message and subsequently implement the radio link-related operation.

20 [0028] FIG. 2 illustrates a communication system 106, as per one example, for performing a radio link-related operation for managing radio link with a Node B, such as the Node B 104. The communication system 106 may be implemented as a radio network controller (i.e., an RNC) when implemented as a UMTS based communication system. In the present example, the communication system 106 includes processor(s)
25 202, memory 204, and interface(s) 206. The processor(s) 202 may also be implemented as signal processor(s), state machine(s), and/or any other device or component that manipulate signals based on operational instructions. The interface(s) 206 may include a variety of interfaces, for example, interfaces for data input and output, and for exchanging a variety of operational instructions between other systems,
30 such as the systems within the communication network 100. The interface(s) 206 may also be relied for implementing communication over a radio frequency interface between the communication system 106 and Node B 104, and the communication system 106 and the core network 110, as depicted in FIG. 1. The interface(s) 206 may be implemented as either hardware or software.

[0029] The memory 204 may store one or more executable instructions, which may be fetched and executed so as to perform one or more radio link-related operations for the radio link with the UEs. An example of such an instruction includes, but is not limited to, firmware for the communication system 106 for implementing multiple functionalities. The memory 204 may also be used for storing data which may be generated or utilized during the operation of the communication system 106. The memory 204 may be non-transitory computer-readable medium including, for example, volatile memory, such as RAM, or non-volatile memory such as EPROM, flash memory, and the like. The communication system 106 is also capable for exchanging information and signals with Node B 104 and the core network 110.

[0030] The communication system 106 may further include module(s) 208 and data 210. The module(s) 208 may be implemented as a combination of hardware and programming (e.g., program instructions) to implement one or more functionalities of the module(s) 208. In one example, the module(s) 208 include a radio link manager 112 and a template generator 212. The communication system 106 may further include other module(s) 214 for implementing other functionalities. The data 210 includes information that may be utilized or generated by module(s) 208 during the course of operation of the communication system 106. In one example, the data 210 includes link-related parameters 216, radio link template(s) 218 and other data 220.

[0031] In examples described herein, such combinations of hardware and programming may be implemented in a number of different ways. For example, the programming for the module(s) 208 may be processor executable program instructions stored on a non-transitory machine-readable storage medium and the hardware for the module(s) 208 may include processing resource (e.g., one or more processors), to execute such program instructions. In the present examples, the machine-readable storage medium may store program instructions that, when executed by the processing resource, implement the functionalities of module(s) 208. In such examples, the communication system 106 may include the machine-readable storage medium storing the program instructions and the processing resource to execute the program instructions, or the machine-readable storage medium may be separate but accessible to communication system 106 and the processing resource. In other examples, module(s) 208 may be implemented by electronic circuitry.

[0032] As will be explained, the operation of the communication system 106 for managing the radio link may be broadly considered to comprise at least a stage for

generation of template, and subsequently managing the radio link for performing the radio link-related operation. The operation of the communication system 106 is explained in conjunction with the call flow diagrams as illustrated in FIGS. 4-5. FIG. 4 illustrates a call flow diagram depicting the interactions between the communication system 106 and the Node B 104 for generating one or more radio link templates, which are eventually stored as radio link template(s) 218. FIG. 5 on the other hand illustrates a call flow diagram depicting the interactions between the communication system 106 and the Node B 104 for managing the radio link between the Node B 104 and one or more UEs 102.

[0033] Initially, the communication system 106 may ascertain whether the Node B 104 is capable of supporting radio link templates. To such an end, the communication system 106 may receive a capability indication from the Node B 104. Based on the value specified in the capability indication received from Node B 104, the communication system 106 may determine whether the Node B 104 supports radio link templates, or not. For example, the capability indication may be provided as a bit-field in a message. A non-zero value of the capability indication may indicate that the Node B 104 supports and is capable of processing radio link template(s) 218 for affecting the radio link-related operation. In another example, the capability indication is implemented within a private information element. The transmission of the capability indication message is represented as step 402 in FIG. 4.

[0034] If the capability indication denotes that the Node B 104 does not support the radio link template(s) 218 or if that Node B 104 does not respond, the communication system 106 would continue to share one or more link-related parameters 216 depending on whether the radio link is to be set-up or whether an existing radio link is to be reconfigured. In one example, if the capability indication indicates that the Node B 104 supports radio link template(s) 218, radio link manager 112 within the communication system 106 may obtain one or more parameters from the link-related parameters 216. The link-related parameters 216 may be understood as parameters which may be utilized by communication system 106 for managing the radio link between the Node B 104 and the UEs 102. It may be understood that besides the capability indication message indicating that the Node B 104 supports radio link template(s) 218, the radio link manager 112 may also obtain the parameters from the link-related parameters 216 based on other conditions. For example, the radio link manager 112 may obtain the parameters from the link-related parameters 216 in case

when the cell is set-up or in cases where one or more features corresponding to the radio link also changes. It may be noted that the present set of examples is only indicative and should not be construed as limiting the scope of the present subject matter.

5 **[0035]** In one example, the link-related parameters 216 are a common set of parameters that may be applicable to one or more subscribers within a given area. Common set of parameters may be considered as such parameters, wherein which their corresponding value is same across the subscribers. In the context of UMTS based communication system, examples of common set of parameters include, but
10 are not limited to, puncturing limit, E-TFCI Table Index, Reference E-TFCI Information, E-DPCCH Power Offset, Maximum number of retransmissions for E-DCH and SRB logical channel information, as specified in the 3GPP TS 25.433. The link-related parameters 216 may either be fully or partially hard-coded within the communication system 106. In another example, the common set of parameters may be configured
15 through user interfaces provided on the communication system 106. It may be noted that the present examples are depicted considering link-related parameters 216 to be the common set of parameters, as described above. In certain other examples, the link-related parameters 216 may include other parameters based on which one or more radio link-related operations may be performed.

20 **[0036]** Once the link-related parameters 216 are obtained, the template generator 212 may, based on the obtained link-related parameters 216, generate radio link template(s) 218. The radio link template(s) 218 thus generated, are such that they include the link-related parameters 216 along with the corresponding value, based on which a radio link is to be managed. In one example, the template generator 212 may
25 utilize a schema for generating the radio link template(s) 218. Once the radio link template(s) 218 is generated, the radio link manager 112 generates unique identifiers for the generated radio link template(s) 218. In one example, the unique identifier may be generated by hashing the corresponding values of the parameters included in the radio link template(s) 218. The generation of the radio link template(s) 218 by the
30 template generator 212 is represented by step 404 as depicted in FIG. 4.

[0037] Once the radio link template(s) 218 are generated, the communication system 106 transmits the radio link template(s) 218 to the Node B 104, from which, in an example, the capability indication confirming the support for radio link template(s) 218 was received. In one example, the radio link template(s) 218 may be transmitted

over messages utilizing the NBAP signalling protocol. In the present example, the radio link template(s) 218 may be communicated as a message through signalling mechanisms which may be proprietary to particular vendors of the communication system 106 and the Node B 104. In another example, the radio link template(s) 218 are transmitted to the Node B 104 as embedded in a private information element within the message. The transmission of the radio link template(s) 218 by the communication system 106 to the Node B 104 is represented as step 406 as depicted in FIG. 4. Once the radio link template(s) 218 are received by the Node B 104, the Node B 104 retains the radio link template(s) 218 within their storage memory. This is represented by step 408 as depicted in FIG. 4. The Node B 104 may validate the radio link template(s) 218 received from the communication system 106 before retaining the same for subsequent processing. For example, the Node B 104 may check and confirm whether the radio link template(s) 218 received from the communication system 106 are each associated with a unique identifier.

[0038] Subsequently, the radio link template(s) 218 are processed by the Node B 104 for managing the radio link with the UEs 102. FIG. 3 illustrates a block diagram of an example Node B, such as the Node B 104. The Node B 104 comprises a processor(s) 302, memory 304, interface(s) 306 and the transceiver 308. In addition, the Node B 104 may also include module(s) 310 and data 312. The module(s) 310 may be considered as one or more applications which when executed implement the functionality of the Node B 104. It may be noted that the aforesaid components of Node B 104 may be similar to corresponding components of the communication system 106. The manner in which these components are implemented are not repeated again for sake of brevity.

[0039] Continuing with the explanation for Node B 104, the module(s) 310 further comprises a parsing module 314, message processor 316 and other module(s) 318. The other module(s) 316 may include such modules for implementing other functionality of the Node B 104. The data 312 comprises a mapping table 320, radio link template(s) 218, radio link configuration message(s) 322 and other data 324. As discussed previously, the Node B 104 stores and retains the radio link templates received from communication system 106 as radio link template(s) 218. The mapping table 320 provides a mapping table which maps unique identifiers to their corresponding radio link template(s) 218. The operation of the Node B 104 is described in conjunction with FIG. 5.

[0040] FIG. 5 on the other hand illustrates a call flow diagram depicting the interactions between the communication system 106 and the Node B 104 for managing the radio link between the Node B 104 and one or more UEs 102. FIG. 5 may be considered as illustrating stages involving the management of radio link by the Node B 104 based on radio link template(s) 218.

[0041] It may be the case that the radio link manager 112 may determine that a radio link-related operation, such as either setting up a radio link or reconfiguring an existing radio link, is to be performed. Such operations may be performed based the condition of the network, which in turn may be communicated by the UEs 102 as one or more measurement reports. The radio link manager 112 in the communication system 106 may then process the measurements to determine whether any radio link-related operation is to be performed. The measurement report may be generated either periodically or may be generated based on the occurrence of a predefined event.

[0042] Once the radio link manager 112 has ascertained that a certain radio link-related operation is to be performed, it may further determine one or more parameters, such as the link-related parameters 216 based on which a radio link-related operation is to be carried out. It may be noted that the number, type and corresponding value of the parameters thus selected may be based on the type of radio link-related operation. For example, the link-related parameters 216 may differ when a radio link is to be set up as compared to when an existing radio link is to be reconfigured.

[0043] To this end, a request message is generated by radio link manager 112. Through the request message, the communication system 106 may indicate that a radio link-related operation is to be performed. For example, the request message from the communication system 106 may indicate that the either radio link is to be set-up or that an existing radio link is to be reconfigured. For generating the request message, the radio link manager 112 within the communication system 106 may determine one or more parameters, such as the link-related parameters 216 based on which a radio link-related operation is to be carried out.

[0044] With the link-related parameters 216 identified, the radio link manager 112 generates a request message pertaining to the appropriate radio link-related operation to be performed. In order to generate the request message, the radio link manager 112 may initially determine the radio link template(s) 218 which include the link-related parameters 216 based on which the radio link-related operation is to be performed. Once the appropriate radio link template(s) 218 are identified, the radio link manager

112 may determine their corresponding unique identifier. In one example, the unique identifier may be determined by the radio link manager 112 through a reference table stored in other data 220. The reference table, amongst other things, may provide a mapping between the link-related parameters 216 and the radio link template(s) 218 within which such parameters are included. The determination of the appropriate unique identifiers of the radio link template(s) 218 is represented as step 502, as depicted in FIG. 5.

[0045] The radio link manager 112 subsequently may generate a request message indicating the type of radio link-related operation and one or more unique identifiers corresponding to radio link template(s) 218. As mentioned previously, the pertinent radio link template(s) 218 include the link-related parameters 216 corresponding to which the radio link-related operation is to be performed. The link-related parameters 216, in one example, are a common set of parameters that may be applicable to one or more subscribers within a given area. Common set of parameters may be considered as such parameters, wherein which their corresponding value is same across the subscribers with examples including puncturing limit, E-TFCI Table Index, Reference E-TFCI Information, E-DPCCH Power Offset, Maximum number of retransmissions for E-DCH and SRB logical channel information. It is for such parameters, the identifiers are determined and included in the request message 506. In one example, the request message 506 in addition to the identifiers of the link-related parameters 216, may further include parameters. Examples of such parameters include identities and user-specific parameters, as per the 3GPP TS 25.433. The generation of the request message by the communication system 106 is represented as step 504, as depicted in FIG. 5.

[0046] The generated request, indicated as request message 506, is transmitted to the Node B 104. The request message 506 may be transmitted. In the context of the UMTS based architecture, the communication system 106 may transmit the request message 506 to the Node B 104 over the *Iub* interface. In one example, the request message 506 is stored as other data 324 within Node B 104. The transmission of the request message 506 to the Node B 104 is represented as step 508, as depicted in FIG. 5.

[0047] The Node B 104 on receiving the request message 506 from the communication system 106, processes the same for performing the intended radio link-related operation. As discussed previously, radio link-related operations include, but

are not limited to, setting up a radio link and reconfiguring an existing radio link between the Node B 104 and UEs 102. Other types of radio link-related operation may also be performed without deviating from the scope of the present subject matter.

[0048] Once received, the request message 506 is parsed by the parsing module 314. The parsing module 314 may process the request message 506 for determining the unique identifiers included therein. In one example, the parsing module 314 may parse the private information element of the request message 506 to determine the unique identifiers. The parsing module 314 based on the unique identifiers, further identifies the corresponding radio link template(s) 218 which may be stored within the Node B 104. In one example, the parsing module 314 may compare the unique identifiers with one or more entries within the mapping table 320. The mapping table 320, in an example, may include a mapping between a plurality of unique identifiers and their corresponding radio link template(s) 218. The identification of the appropriate radio link template(s) 218 is represented as step 510, depicted in FIG. 5.

[0049] The identified radio link template(s) 218 may then be further processed by the message processor 316. In one example, the message processor 316 may process the radio link template(s) 218 to determine the link-related parameters 216, included therein. The link-related parameters 216 may include such parameters based on which the intended radio link-related operation, such as either setting up a radio link, reconfiguring an existing radio link, etc., may be implemented. Returning to the present step, the message processor 316 may then generate radio link configuration message(s) 322. The radio link configuration message(s) 322 may be considered as such messages or instructions which may be processed by the Node B 104. When processed, the Node B 104 implements one or more functionalities, such as radio link-related operations. In one example, the radio link configuration message(s) 322 may be similar to standardized request messages that would have been transmitted by an RNC in case the radio link template(s) 218 were not supported. In such a case, as would be noted, instead of receiving the standardized request message from communication system 106, the Node B 104 is able to generate such radio link configuration message(s) 322 (which in turn are similar to standardized request messages). The generated radio link configuration message(s) 322 is further processed by the message processor 316 for implementing the intended radio link-related operation. To this end, the radio link configuration message(s) 322 may be further provided to lower layered components within the Node B 104 for performing

the radio link-related operation.

[0050] Alternatively, in another example, the message processor 316 may provide the received request message to the lower layered components present within the Node B 104. In such cases, the lower layered components may determine the embedded template identifier from the request message received from the communication system 106 and accordingly obtain the radio link template(s) 218. The lower layered components may further determine the link-related parameters 216 based on which, it may generate radio link configuration message(s) 322 and subsequently perform the radio link-related operation. The generation and processing of the radio link configuration message(s) 322 based on radio link template(s) 218 by message processor 316 is represented as steps 512-514, as depicted in FIG. 5.

[0051] It may be noted that despite the examples being explained in the context of UMTS based architecture, similar approaches may also be implemented for other mobile communication architectures. For example, managing radio link based on one or more radio link templates may be implemented for 4G and 5G networks as well, as described in 3GPP TR 38.801. Such networks include Evolved Node B (eNode B) and gNode B, respectively. In the context of 4G/5G networks, eNode B/gNode B forms the network element which provides the connectivity of one or more UEs, such as UEs 102, with the core network. In the context of eNode B and gNode B, it may be noted that the functionality of such entities, i.e., the eNode B and gNode B is controlled and performed by such entities themselves. As would be understood, networked communication systems may be logically abstracted into different layers which may be in communication with each other. Typically, such layers are arranged with lower layers affect transmission of data streams over a physical medium, and higher layers which perform functions pertaining to controlling and managing of the communication related operations. In such cases, signalling may often occur between different logical and abstracted layers of any communication framework over a radio or a communication link. With respect to such implementations, the signaling may involve performing one or more radio link-related operations. In one example, one or more radio link-related operations may be performed based on radio link template(s) 218.

[0052] For example, a gNode B may further include one or more distribution units and a centralized unit, i.e., in instances when the gNode B is implemented in a cloud-based platform. The distribution units may be implemented as lower layers, with the centralized unit being implemented as higher layers, with the centralized unit being

responsible for controlling the functioning and operation of the distribution units. Generally, the distribution unit may perform one or more radio link-related operation pertaining to the radio link between one or more UEs and the gNobe B. In the context of the present subject matter, the radio link-related operation may be performed based on templates, such radio link template(s) 218.

[0053] In such a case, the centralized unit may select a number of radio link-based parameters based on which the radio link-related operation is to be performed. Once the parameters are selected, a plurality of radio link templates may be generated by the centralized unit, with each radio link template including one or more radio-link based parameters and associated with a corresponding unique identifier. The centralized unit may subsequently transmit the generated radio link templates to a distribution unit. In one example, the distribution unit may generate a mapping which maps the stored radio link templates with their corresponding identifiers.

[0054] During the course of operation, the centralized unit may determine that a radio link-related operation is to be performed. Examples of such radio link-related operations include, but are not limited to, creating a radio link and reconfiguring an existing radio link. Depending on the radio link-related operation to be performed, the centralized unit may generate a request message which may indicate the pertinent radio link-related operation to be performed and one or more template identifiers. The request message is transmitted by the centralized unit to the appropriate distribution unit.

[0055] The distribution unit on receiving the request message processes the same to obtain the template identifiers included therein. Corresponding to the template identifiers, the distribution unit may retrieve the appropriate radio link template. The distribution unit may proceed and obtain the parameters included in the retrieved radio link-related parameters. The distribution unit may then proceed and process the obtained parameters for performing the intended radio link-related operation. It may be noted that although the present example is described in the context of gNobe B and 5G-based communication framework, the same may be implemented for an eNode B and 4G-based communication framework, without limiting the scope of the present subject matter.

[0056] FIGS. 6 and 7 illustrate example methods 600 and 700, respectively, for managing the radio link between an communication system such as an RNC and a Node B, according to an example of the present subject matter. The order in which the methods

are described is not intended to be construed as a limitation, and any number of the described method blocks may be combined in any order to implement the aforementioned methods, or an alternative method. Furthermore, methods 600 and 700 may be implemented by processing resource or computing device(s) through any suitable hardware, non-transitory machine-readable program instructions, or combination thereof, or through logical circuitry.

[0057] It may also be understood that methods 600 and 700 may be performed by programmed and/or configured network devices present within a communication network, with such devices including the communication system 106 as depicted in FIGS. 1-2, and Node B 104 as depicted in FIGS. 1 and 3. Furthermore, in certain circumstances, program instructions stored in a non-transitory computer readable medium when executed may implement methods 600 and 700 through the respective devices, as will be readily understood. The non-transitory computer readable medium may include, for example, digital memories, magnetic storage media, such as one or more magnetic disks and magnetic tapes, hard drives, or optically readable digital data storage media. Although, the methods 600 and 700 are described below with reference to the communication system 106 and the Node B 104, as described above, other suitable systems for the execution of these methods can be utilized. Additionally, implementation of these methods is not limited to such examples.

[0058] At block 602, a request message from a radio network controller is received, with the request message being embedded with a template identifier. For example, the request message may be generated by the radio link manager 112 based on one or more parameters, such as the link-related parameters 216 which in turn are included in the radio link template(s) 218. Such link-related parameters 216 may be such parameters based on which a radio link-related operation is to be carried out. In one example, the request message 506 may include one or more unique identifiers corresponding to one or more radio link template(s) 218. The request message generated by the radio link manager 112 is transmitted by the communication system 106 and received by the Node B 104, as request message 506.

[0059] At block 604, one or more stored radio link template from amongst a set of radio link templates based on the embedded template identifier are identified. For example, the parsing module 314 within the Node B 104 processes the request message 506 for determining the unique identifiers included therein. The parsing module 314 may then compare the unique identifiers with one or more entries within

the mapping table 320 which provide a mapping between a plurality of unique identifiers and their corresponding radio link template(s) 218. Based on the comparison with the mapping table 320, the appropriate radio link template(s) 218 stored within the Node B 104 are identified.

5 [0060] At block 606, based on the retrieved radio link template a corresponding radio link-related operation is performed. For example, on determining the appropriate radio link template(s) 218, the message processor 316 may determine the link-related parameters 216 included within such templates. In one example, based on link-related parameters 216 determined from the radio link template(s) 218, the message
10 processor 316 may then generate one or more radio link configuration message(s) 322. The radio link configuration message(s) 322 may be considered as such messages or instructions which may be processed by the Node B 104 for carrying out radio link-related operations, say an NBAP message. The radio link configuration message(s) 322 may be further provided to lower layered components within the Node
15 B 104 for performing the radio link-related operation. Alternatively, in another example, the message processor 316 may provide the received request message to the lower layered components present within the Node B 104. In such cases, the lower layered components may determine the embedded template identifier from the request message received from the communication system 106 and accordingly obtain the
20 radio link template(s) 218. The lower layered components may further determine the link-related parameters 216 based on which, it may generate radio link configuration message(s) 322 and subsequently perform the radio link-related operation.

[0061] FIG. 7 depicts an example method 700 for managing the radio link between various systems within a communication network. Examples of such systems include
25 a Node B and a communication system 106. In one example, the communication system 106 is a radio network controller within UMTS based architectures.

[0062] At block 702, a capability indication (CI) message is received from a Node B present within a communication network. For example, the communication system 106 may receive a capability indication from the Node B 104. The capability indication may
30 indicate whether a Node B, such as the Node B 104 supports radio link template(s) 218. The capability indication may be provided as a bit-field in a message wherein non-zero value of the capability indication may indicate that the Node B 104 is capable of supporting radio link template(s) 218 for managing radio link with the UEs 102.

[0063] At block 704, a determination is made whether the CI indicates that the Node

B supports radio link template. For example, the radio link manager 112 may ascertain whether the Node B 104 supports the radio link template(s) 218 or not. If the radio link manager 112 determines that radio link template(s) 218 are not supported by the Node B 104 ('No' path from block 704), the present process may end with the communication system 106 affecting any further radio link-related operations may be implemented through one or more request messages bearing the link-related parameters 216 being transmitted to the Node B 104.

[0064] In one example, however, if the radio link manager 112 determines that the Node B 104 does support the radio link template(s) 218 ('Yes' path from block 704), the method proceed to block 706, wherein a plurality of common radio link-related parameters for managing a radio link are obtained. For example, the radio link manager 112 within the communication system 106 may identify a number of link-related parameters 216. The link-related parameters 216 may include a common set of parameters with their corresponding values being same across the subscribers. Although the method 700 commences with determination of the capability indication message, it may be understood that besides the capability indication message indicating that the Node B 104 supports radio link template(s) 218, the radio link manager 112 may also obtain the parameters from the link-related parameters 216 based on other conditions. For example, the radio link manager 112 may obtain the parameters from the link-related parameters 216 in case when the cell is set-up or in cases where one or more features corresponding to the radio link may undergo changes. It may be noted that the present set of examples is only indicative and should not be construed as limiting the scope of the present subject matter.

[0065] At block 708, a set of predefined radio link template are generated. For example, template generator 212 template generator 212, based on the obtained link-related parameters 216, generates radio link template(s) 218. The radio link template(s) 218 thus generated, are such that they include the link-related parameters 216 along with the appropriate corresponding value, based on which a radio link is to be managed. Each of the radio link template(s) 218 are further identifiable through their corresponding unique identifiers.

[0066] At block 710, the set of predefined radio link templates are transmitted to the Node B. For example, the radio link manager 112 transmits the radio link template(s) 218 to the Node B 104. In one example, the radio link template(s) 218 may be transmitted over messages utilizing the NBAP signalling protocol.

[0067] At block 712, the set of radio link templates are received and stored by Node B. For example, on receiving the radio link template(s) 218, the Node B 104 stores the same within their storage memory. In another example, the Node B 104 may validate the radio link template(s) 218 received from the communication system 106 before
5 retaining the same for subsequent processing. In another example, the Node B 104 may check and confirm whether the radio link template(s) 218 received from the communication system 106 are each associated with a unique identifier.

[0068] At block 714 a request message, which includes an identifier, is generated and transmitted by the radio network controller. For example, the request message
10 may be generated by the radio link manager 112. To this end, the radio link manager 112 may initially determine that a radio link-related operation is to be performed depending on the conditions of the network. The conditions of the network may be assessed by the radio link manager 112 based on, in one example, measurement reports generated by the one or more UEs 102. In the event that a radio link-related
15 operation is to be performed, the radio link manager 112 may obtain one or more link-related parameters 216, which would be utilized for implementing the intended radio link-related operation. Thereafter, the radio link manager 112 generates a request message. To generate the request message, the radio link manager 112 may initially determine the radio link template(s) 218 which include the link-related parameters 216
20 based on which the radio link-related operation is to be performed. Once the appropriate radio link template(s) 218 are identified, the radio link manager 112 may determine their corresponding unique identifier. The request message, say request message 506, which includes the unique identifiers of one or more radio link template(s) 218, is generated by the communication system 106 and transmitted to the
25 Node B 104.

[0069] At block 716, the request message received by Node B is parsed to identify one or more template identifiers. For example, the request message 506 received by Node B 104 is parsed by the parsing module 314. The parsing module 314 may process the request message 506 for determining the unique identifiers included
30 therein.

[0070] At block 718, one or more radio link templates from amongst a plurality of stored radio link templates are retrieved based on the identified template identifier. For example, the parsing module 314, based on the unique identifiers, further identifies the corresponding radio link template(s) 218 which may be stored within the Node B 104.

In one example, the parsing module 314 may rely on mapping table 320 which includes a mapping between a plurality of unique identifiers and their corresponding radio link template(s) 218.

[0071] At block 720, radio link configuration message based on parameters included in the retrieved radio link template is generated by Node B. For example, the identified radio link template(s) 218 may then be further processed by the message processor 316, which in turn determines the link-related parameters 216, included in the identified radio link template(s) 218. The radio link configuration message(s) 322 may be considered as such messages or instructions which may be processed by the Node B 104. The radio link configuration message(s) 322 may be further provided to lower layered components within the Node B 104 for performing the radio link-related operation. In an alternative example, the message processor 316 may provide the received request message to one or more lower layered components within the Node B 104. In such cases, the lower layered components may determine the template identifier from the request message received from the communication system 106 and accordingly obtain the radio link template(s) 218. The lower layered components may further determine the link-related parameters 216 based on which, it may generate radio link configuration message(s) 322, and thereafter perform the radio link-related operation.

[0072] At block 722, the radio link configuration message is processed by Node B. For example, the generated radio link configuration message(s) 322 is further processed by the message processor 316 for implementing the intended radio link-related operation. When processed, the Node B 104 implements one or more functionalities, such as radio link-related operations.

[0073] FIG. 8 illustrates a system environment 800 for managing radio link based on one or more radio link templates, according to one example. The system environment 800 may comprise at least a portion of a public networking environment or a private networking environment, or a combination thereof. In one example, the system environment 800 includes a processing resource 802 communicatively coupled to a computer readable medium 804 through a communication link 806.

[0074] For example, the processing resource 802 can include one or more processors of a computing device, such as processor(s) 202 of communication system 106. The computer readable medium 804 can be, for example, an internal memory device of the computing device or an external memory device. In one example, the

communication link 806 may be a direct communication link, such as any memory read/write interface. In another example, the communication link 806 may be an indirect communication link, such as a network interface. In such a case, the processing resource 802 can access the computer readable medium 804 through a network 808. The network 808 may be a single network or a combination of multiple networks and may use a variety of different communication protocols.

[0075] The processing resource 802 and the computer readable medium 804 may also be coupled to data sources 810 through the communication link 806, and/or to networked devices 812 over the network 808. The coupling with the data sources 810 enables in receiving the data in an offline environment, and the coupling with the networked devices 812 enables in receiving the data in an online environment.

[0076] In one example, the computer readable medium 804 includes a set of computer readable program instructions, implementing a radio link module 814 and a template generator 816. The set of computer readable program instructions can be accessed by the processing resource 802 through the communication link 806 and subsequently executed to fetch data from data sources 810. When executed by processing resource 802, the program instructions of the radio link module 814 and the template generator 816 may implement the functionalities described above in relation to the communication system 106.

[0077] In operation, the radio link module 814 obtains one or more parameters, such as the link-related parameters 216, which may be eventually utilized for performing a radio link-related operation, for example setting up a radio link or reconfiguring an existing radio link. Once the link-related parameters 216 are obtained, the template generator 816 may, based on the obtained link-related parameters 216, generate one or more radio link template(s) 218. The radio link template(s) 218 thus generated, are such that they include the link-related parameters 216 along with the appropriate value, based on which a radio link is to be managed. In one example, the template generator 816 may generated based on a schema. Once the radio link template(s) 218 are generated, the radio link module 814 generates unique identifiers for the generated radio link template(s) 218.

[0078] With the radio link template(s) 218 generated, the radio link module 814 causes transmissions of the radio link template(s) 218 to the Node B 104 which in turn is capable of supporting radio link template(s) 218. In one example, the radio link template(s) 218 may be transmitted over messages utilizing the NBAP signalling

protocol. In another example, the radio link template(s) 218 are transmitted to the Node B 104 as embedded in a private information element within the message. Once the radio link template(s) 218 are received by the Node B 104, the Node B 104 retains the radio link template(s) 218 within their storage memory.

- 5 **[0079]** Although examples for the present disclosure have been described in language specific to structural features and/or methods, it is to be understood that the appended claims are not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed and explained as examples of the present disclosure.

I/We Claim:

1. A communication system comprising:
a processor;
5 radio link manager coupled to the processor, wherein radio link manager is to:
determine an identifier based on a radio link-related operation to be
performed for a radio link between a Node B and a user equipment within a
telecommunication network, wherein the identifier corresponds to a radio link
template comprising a radio link-related parameter and corresponding value;
10 and
generate a request message, wherein the request message includes the
identifier.
2. The communication system as claimed in claim 1, wherein the radio link-related
15 operation is one of setting up of another radio link and reconfiguring an existing radio
link.
3. The communication system as claimed in claim 2, wherein the radio link
manager is to reconfigure the existing radio link at an instant which occurs at one of
20 periodically and based on occurrence of an event.
4. The communication system as claimed in claim 1, wherein the identifier is
selected from a plurality of identifiers, with each of the plurality of identifiers
corresponding to a respective radio link template from a set of radio link templates.
25
5. The communication system as claimed in claim 1, wherein the request message
includes the identifier within a private information element of the request message.
6. The communication system as claimed in claim 1, wherein the radio link
30 manager is to further transmit the request message to the Node B for the radio link-
related operation.

7. The communication system as claimed in claim 1, further comprising:
a template generator to:

obtain a plurality of common radio link-related parameters, wherein each
of the common radio link-related parameters corresponds to the radio link with

Node B;

generate a set of radio link templates for transmission to Node B,
wherein the set of radio link templates are each associated with a unique
identifier and includes the common radio link-related parameter with its
corresponding value; and

transmit the set of radio link templates to Node B.

8. A method comprising:

receiving a request message from a radio network controller, wherein the
request message is embedded with a template identifier;

retrieving a stored radio link template from amongst a set of radio link templates
based on the embedded template identifier, wherein the stored radio link template
comprises at least one parameter pertaining to a radio link-related operation for a radio
link with a user equipment; and

performing the radio link-related operation based on the retrieved stored radio
link template.

9. The method as claimed in claim 8, wherein the retrieving comprises:

parsing the request message to retrieve the template identifier;

comparing the retrieved template identifier with a mapping table, wherein the
mapping table comprises a mapping between a plurality of identifiers and
corresponding plurality of radio link templates; and

based on the comparing, identifying for retrieving the stored radio link template
from amongst the plurality of radio link templates.

10. The method as claimed in claim 8, wherein the performing the radio link-related
operation further comprises:

for parameters of the retrieved radio link template, determining the
corresponding values of the parameters; and

generating a radio link configuration message based on the corresponding values of the parameters of retrieved radio link template.

11. The method as claimed in claim 10, wherein the radio link configuration
5 message is processed for performing the radio link-related operation.

12. A non-transitory computer readable medium comprising program instructions
which when executed cause a communication system to perform at least the following:
obtaining a radio link-related parameter, wherein the radio link-related
10 parameter corresponds to a radio link with a Node B;
generating a radio link template associated with a unique identifier and including
at least the radio link-related parameter with a corresponding value; and
causing transmission of the radio link template to the Node B.

13. The non-transitory computer readable medium as claimed in claim 12 further
15 comprising program instructions to embed the generated radio link template into a
private information element of a message for transmission to the Node B.

14. The non-transitory computer readable medium as claimed in claim 12 further
20 comprising program instructions to generate a request message for the radio link-
related parameter with the Node B, wherein the request message is generated based
on the unique identifier.

15. The program instructions as claimed in claim 14, wherein the request message
25 is for one of establishing a new radio link and reconfiguring an existing radio link,
between the Node B and a user equipment.

100

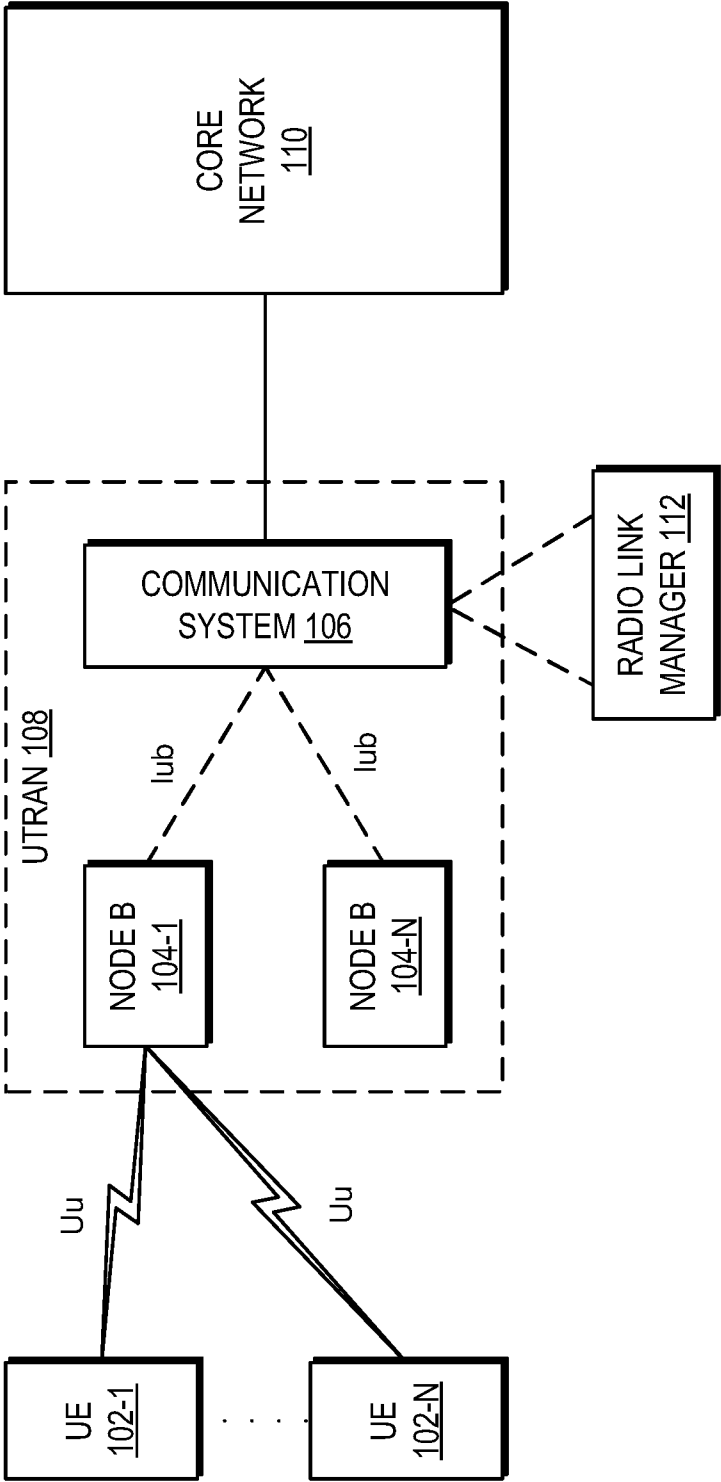


FIG. 1

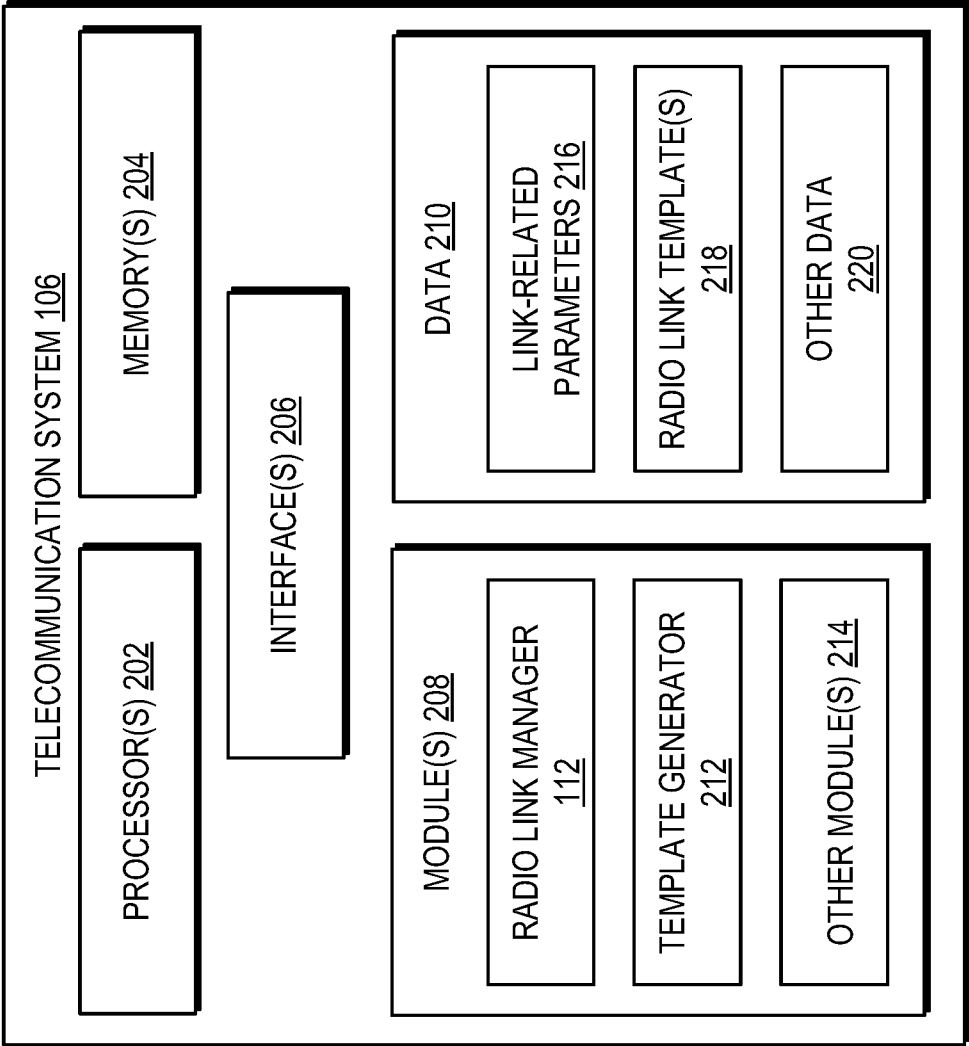


FIG. 2

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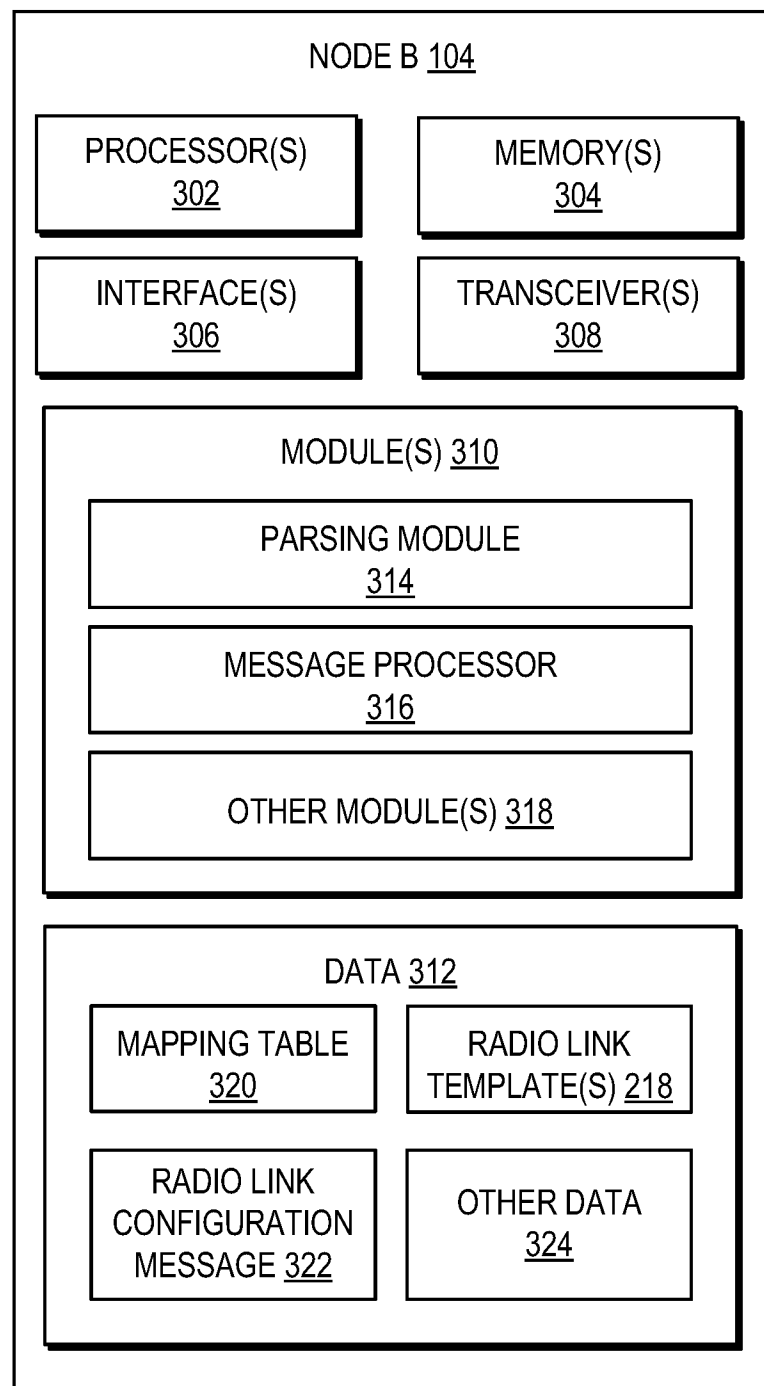


FIG. 3

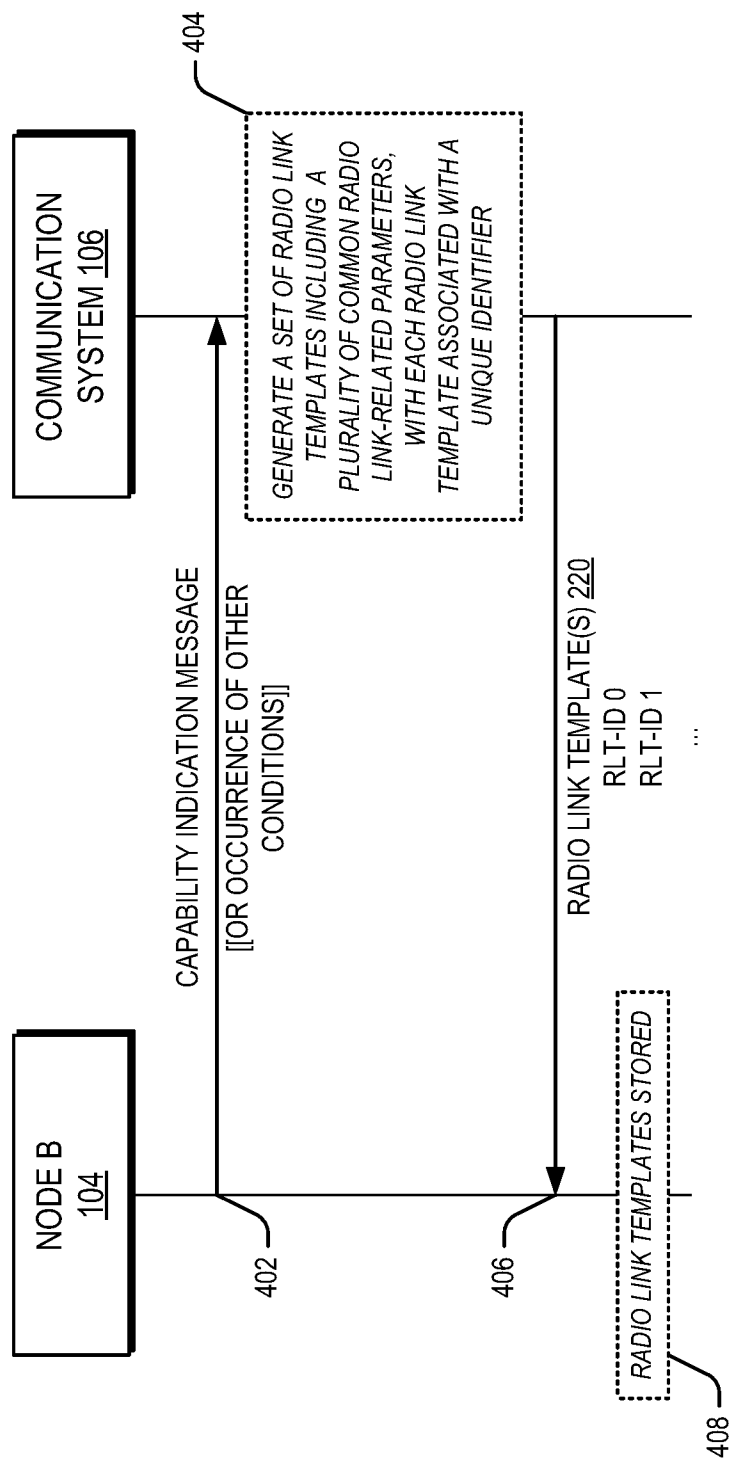


FIG. 4

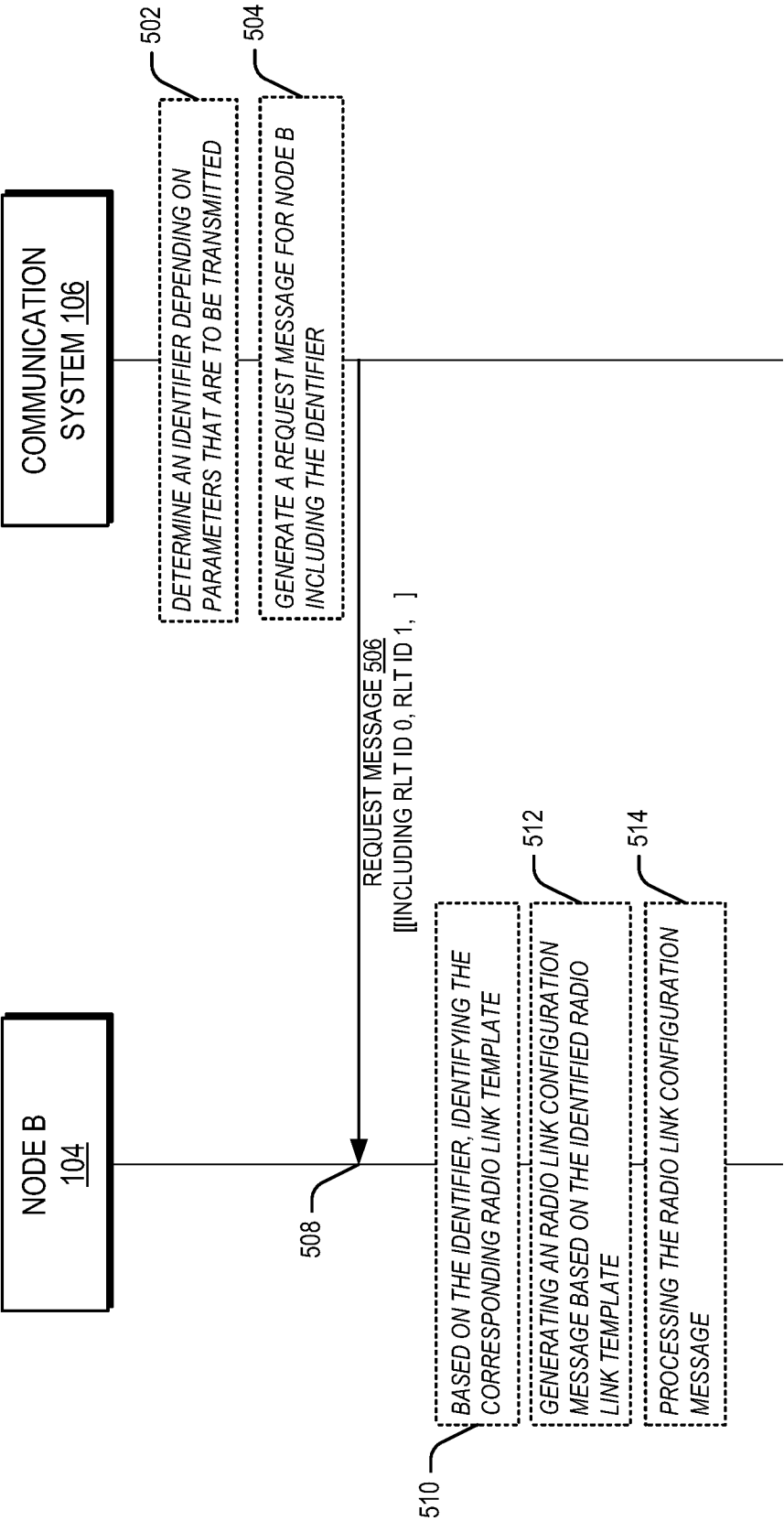


FIG. 5

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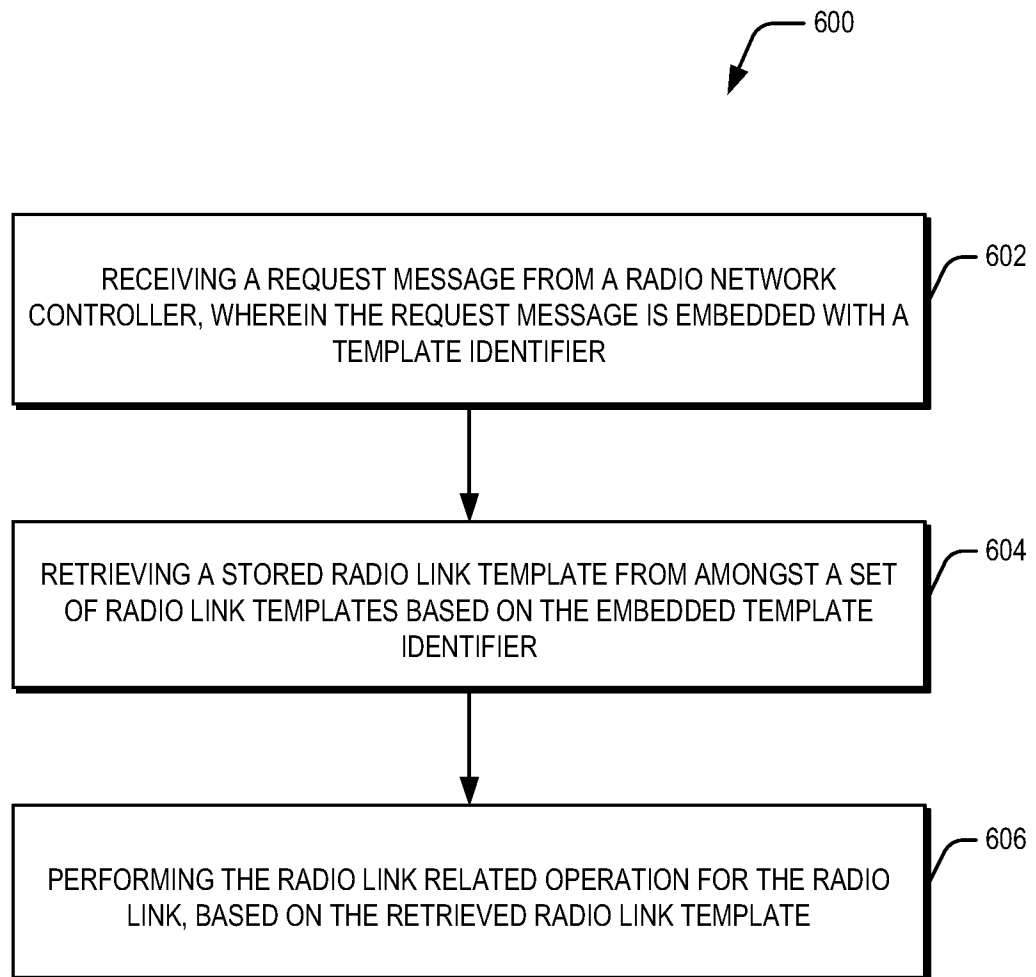


FIG. 6

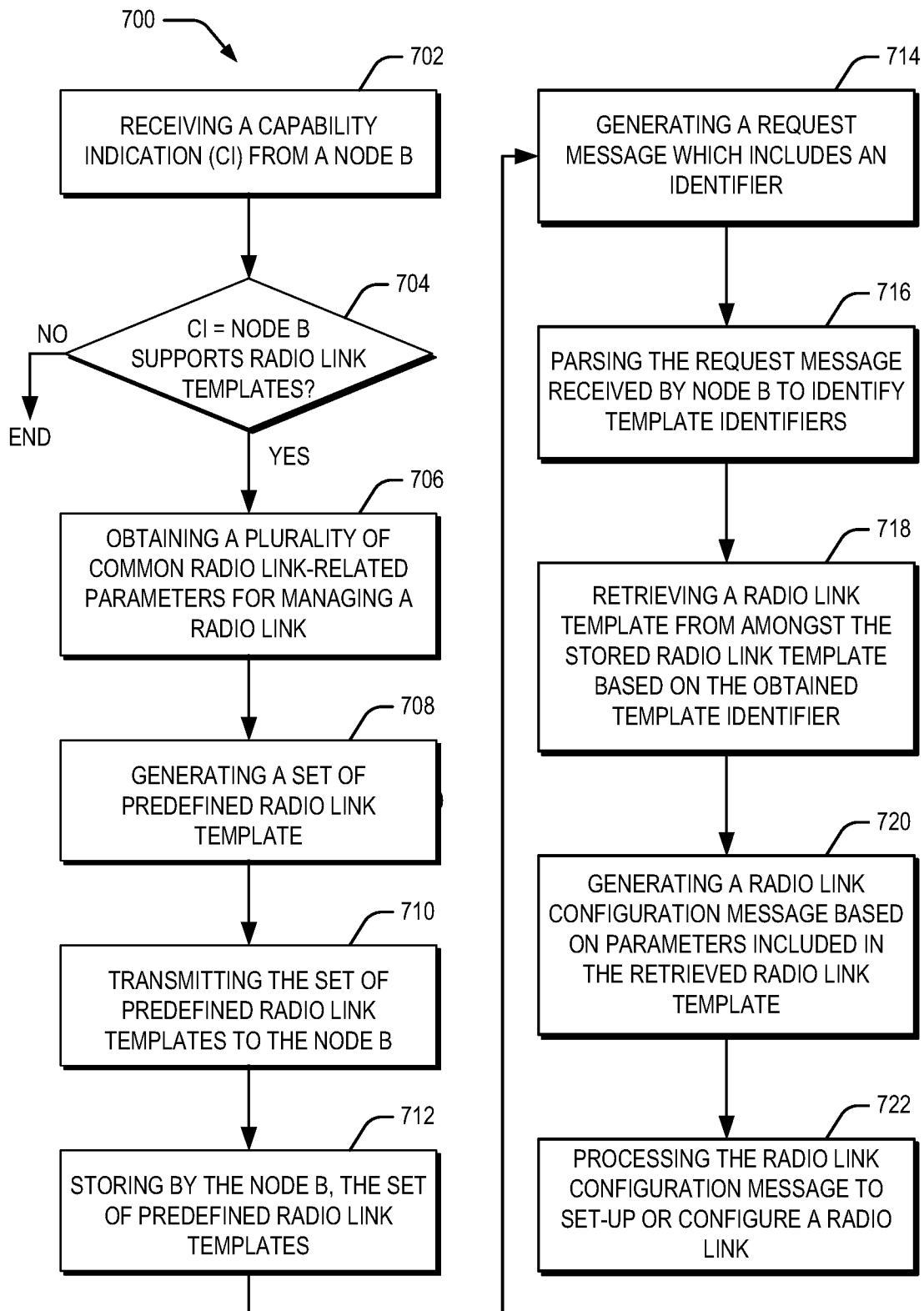
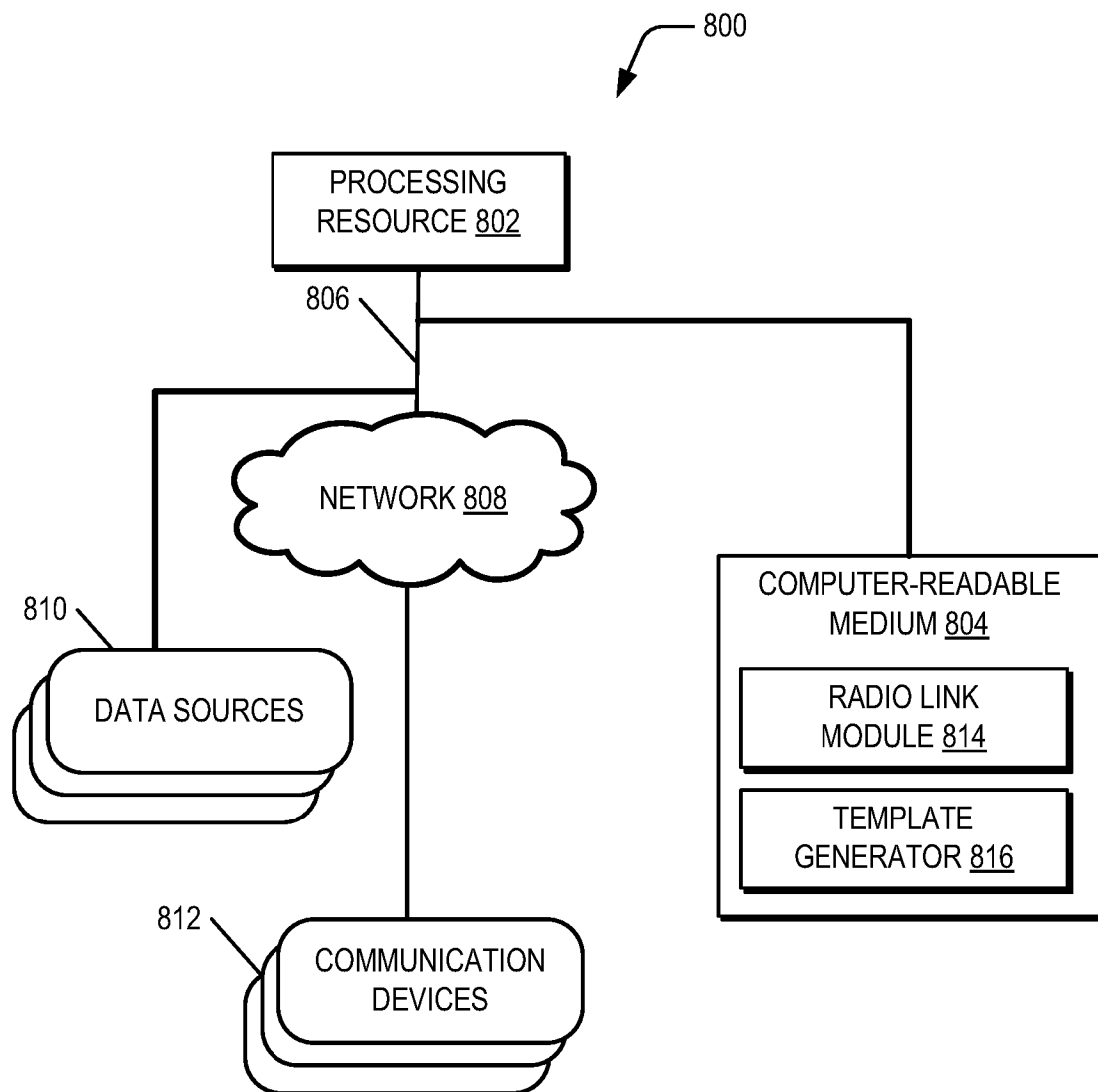


FIG. 7

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**FIG. 8**

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/064370

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W24/02

ADD. H04W76/10 H04W76/20

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)

H04W 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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/076667 A1 (KASHIMA TSUYOSHI [JP] ET AL) 5 April 2007 (2007-04-05) paragraphs [0002] - [0040], [0078] - [0204]	1-15
X	----- EP 1 005 771 A1 (ERICSSON TELEFON AB L M [SE]) 7 June 2000 (2000-06-07) paragraphs [0013] - [0025]	1,4,5
A	----- US 2008/107084 A1 (PICHNA ROMAN [FI] ET AL) 8 May 2008 (2008-05-08) paragraphs [0023] - [0043]	2,3,6-15
A	----- US 2008/107084 A1 (PICHNA ROMAN [FI] ET AL) 8 May 2008 (2008-05-08) paragraphs [0023] - [0043]	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

20 July 2020

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2020/064370

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 2007076667	A1	05-04-2007	EP	1943788 A2	16-07-2008
			KR	20080066757 A	16-07-2008
			TW	200723815 A	16-06-2007
			US	2007076667 A1	05-04-2007
			WO	2007060505 A2	31-05-2007

EP 1005771	A1	07-06-2000	AU	9738498 A	08-03-1999
			BR	9811210 A	25-07-2000
			CA	2297922 A1	25-02-1999
			CN	1267438 A	20-09-2000
			DE	69821243 T2	01-07-2004
			EP	1005771 A1	07-06-2000
			GB	2328581 A	24-02-1999
			HU	0002804 A2	29-01-2001
			NZ	502063 A	26-11-2002
			TW	494692 B	11-07-2002
			US	6185437 B1	06-02-2001
			WO	9909773 A1	25-02-1999

US 2008107084	A1	08-05-2008	CN	101611590 A	23-12-2009
			CN	103152775 A	12-06-2013
			EP	2084853 A1	05-08-2009
			KR	20090075753 A	08-07-2009
			US	2008107084 A1	08-05-2008
			US	2014126366 A1	08-05-2014
			WO	2008053076 A1	08-05-2008
