MECHANISM FOR CHO WITH CANDIDATE SCGS

TECHNICAL FIELD

[0001] The present disclosure relates to wireless communications, and more specifically to devices, methods, apparatuses, and computer readable medium for a mechanism for conditional handover (CHO) with candidate secondary cell group(s) (SCG(s)).

BACKGROUND

[0002] A wireless communications system may include one or multiple network communication devices, such as base stations, which may be otherwise known as an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. Each network communication devices, such as a base station may support wireless communications for one or multiple user communication devices, which may be otherwise known as user equipment (UE), or other suitable terminology. The wireless communications system may support wireless communications with one or multiple user communication devices by utilizing resources of the wireless communication system (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers). Additionally, the wireless communications system may support wireless communications across various radio access technologies including third generation (3G) radio access technology, fourth generation (4G) radio access technology, fifth generation (5G) radio access technology, among other suitable radio access technologies beyond 5G (e.g., sixth generation (6G)).

[0003] It is proposed to specify a CHO with candidate SCG(s) procedure for mobility enhancements. In the CHO with candidate SCG(s) procedure (i.e. in the CHO with at least one candidate SCG procedure, or in the CHO with one or more candidate SCGs procedure), it is the UE that evaluates whether CHO execution condition(s) and CPC/CPA execution condition(s) are fulfilled, when both CHO execution condition(s) and CPC/CPA execution condition(s) are met, the UE performs CHO execution and CPAC execution. To improve mobility robustness, self-organizing network (SON) enhancements for the CHO with candidate SCG(s) should be considered.

SUMMARY

[0004] The present disclosure relates to devices, methods, apparatuses, and computer

readable medium for a mechanism for CHO with candidate SCG(s).

[0005] In some implementations, there is provided a UE. The UE comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the UE to: receive, from a first radio access network (RAN) node, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more conditional primary SCG cell (PSCell) addition and change (CPAC) execution conditions for CHO with candidate SCGs; receive, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure; and in accordance with a determination that at least one trigger condition associated with the at least one time threshold is fulfilled, store or report the first information associated with the successful CHO with candidate SCGs procedure.

[0006] In some implementations, there is provided a first RAN node. The first RAN node comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the first RAN node to: transmit, to a UE, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; and transmit, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure.

[0007] In some implementations, there is provided a target MN. The target MN comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the target MN to: receive, from a UE or a second RAN node, first information or second information, the UE being configured with one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs, the second RAN node being a target secondary node (SN) or a further RAN node; and perform a mobility robustness optimization (MRO) analysis based on the first information or the second information.

[0008] In some implementations, there is provided a source SN. The source SN comprises at least one memory; and at least one processor coupled with the at least one memory and configured to cause the source SN to: determine time related information comprising one of: at least one latest configured timer value for T310 or T312, or a fifth time threshold associated

with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell; and transmit, to a source MN, the time related information.

[0009] In some implementations, there is provided a method performed by the UE. The method comprises: receiving, from a first RAN node, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; receiving, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure; and in accordance with a determination that at least one trigger condition associated with the at least one time threshold is fulfilled, storing or reporting the first information associated with the successful CHO with candidate SCGs procedure.

[0010] In some implementations, there is provided a method performed by the first RAN node. The method comprises: transmitting, to a UE, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; and transmitting, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure.

[0011] In some implementations, there is provided a method performed by the target MN. The method comprises: receiving, from a UE or a second RAN node, first information or second information, the UE being configured with one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs, the second RAN node being a target secondary node (SN) or a further RAN node; and performing a mobility robustness optimization (MRO) analysis based on the first information or the second information.

[0012] In some implementations, there is provided a method performed by the source SN. The method comprises: determining time related information comprising one of: at least one latest configured timer value for T310 or T312, or a fifth time threshold associated with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell; and transmitting, to a source MN, the time related information.

[0013] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and configured to cause the processor to: receive, from a first RAN node, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; receive, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure; and in accordance with a determination that at least one trigger condition associated with the at least one time threshold is fulfilled, store or report the first information associated with the successful CHO with candidate SCGs procedure.

[0014] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and configured to cause the processor to: transmit, to a UE, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; and transmit, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure.

[0015] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and configured to cause the processor to: receive, from a UE or a second RAN node, first information or second information, the UE being configured with one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs, the second RAN node being a target secondary node (SN) or a further RAN node; and perform a mobility robustness optimization (MRO) analysis based on the first information or the second information.

[0016] In some implementations, there is provided a processor for wireless communication. The processor comprises at least one controller coupled with at least one memory and configured to cause the processor to: determine time related information comprising one of: at least one latest configured timer value for T310 or T312, or a fifth time threshold associated with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell; and transmit, to a source MN, the time related

information.

[0017] In some implementations of the method and the UE described herein, further comprising: in accordance with a determination that the time duration between a time when the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled and a time when the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled exceeds the seventh time threshold, determining that the at least one trigger condition associated with the at least one time threshold is fulfilled.

[0018] In some implementations of the method and the UE described herein, further comprising: transmitting, to a second RAN node, the first information associated with the successful CHO with candidate SCGs procedure, wherein the second RAN node is one of: a target MN, a target SN, or a further RAN node.

[0019] In some implementations of the method and the UE described herein, further comprising: transmitting, to the second RAN node, an indication concerning an availability of the first information; and receiving, from the second RAN node, a request for the first information.

[0020] In some implementations of the method and the UE described herein, further comprising: transmitting capability information of the UE indicating one of: the UE supports the CHO with candidate SCGs procedure, or the UE has a capability of storing or reporting the first information associated with the successful CHO with candidate SCGs procedure.

[0021] In some implementations of the method and the UE described herein, further comprising: receiving, from the first RAN node, a third configuration comprising at least one CHO execution condition for CHO-only; and/or receiving, from the first RAN node, a fourth configuration comprising at least one CHO execution condition for CHO with SCG.

[0022] In some implementations of the method and the UE described herein, further comprising: in accordance with a determination that the one or more CHO execution conditions for CHO with candidate SCGs or the one or more CPAC execution conditions for CHO with candidate SCGs are not fulfilled, and at least one of the at least one CHO execution condition for CHO-only is fulfilled, performing a CHO-only execution towards a first target PCell satisfying the at least one of the at least one CHO execution condition for CHO-only; or in accordance with a determination that the one or more CHO execution conditions for CHO with candidate SCGs or the one or more CPAC execution conditions for CHO with candidate SCGs are not fulfilled, and at least one of the at least one CHO execution condition

for CHO with SCG is fulfilled, performing an execution of CHO with SCG towards a second target PCell satisfying the at least one of the at least one CHO execution condition for CHO with SCG and a target PSCell associated with the second target PCell.

[0023] In some implementations of the method and the UE described herein, further comprising: storing or reporting second information.

[0024] In some implementations of the method and the UE described herein, further comprising: transmitting the second information to a second RAN node, wherein the second RAN node is one of: a target MN, a target SN, or a further RAN node.

[0025] In some implementations of the method and the UE described herein, further comprising: in accordance with a determination that an access to the first target PCell of the CHO-only execution or an access to the second target PCell of the execution of CHO with SCG is failed, storing or reporting first failure information.

[0026] In some implementations of the method and the UE described herein, further comprising: in accordance with a determination that an access to the target PSCell associated with the second target PCell of the execution of CHO with SCG is failed, storing or reporting second failure information.

[0027] In some implementations of the method and the first RAN node described herein, further comprising: receiving, from a candidate MN, the first time threshold.

[0028] In some implementations of the method and the first RAN node described herein, further comprising: receiving, from a candidate MN, an indication for determining the fifth and/or sixth time threshold; and determining the fifth and/or sixth time threshold based on the indication.

[0029] In some implementations of the method and the first RAN node described herein, further comprising: transmitting, to a source SN, an indication for providing at least one latest configured timer value for T310 or T312; receiving, from the source SN, the at least one latest configured timer value for T310 or T312; and determining the fifth and/or sixth time threshold based on at least one latest configured timer value for T310 or T312.

[0030] In some implementations of the method and the first RAN node described herein, further comprising: receiving, from a source SN or a candidate MN, the fifth and/or sixth time threshold.

[0031] In some implementations of the method and the first RAN node described herein,

further comprising: receiving, from a second RAN node, first information associated with the successful CHO with candidate SCGs procedure, wherein the second RAN node is one of: a target MN, a target SN, or a further RAN node.

[0032] In some implementations of the method and the first RAN node described herein, further comprising: transmitting, to the UE, a third configuration comprising at least one CHO execution condition for CHO-only; and/or transmitting, to the UE, a fourth configuration comprising at least one CHO execution condition for CHO with SCG.

[0033] In some implementations of the method and the first RAN node described herein, further comprising: receiving, from a second RAN node which is one of a target MN, a target SN, or a further RAN node, second information.

[0034] In some implementations of the method and the first RAN node described herein, further comprising: generating an analysis result indicating at least one of: whether at least one parameter of the one or more CHO execution conditions for CHO with candidate SCGs needs to be optimized, or whether at least one parameter of the at least one CHO execution condition for CHO-only needs to be optimized, or whether at least one parameter of the at least one CHO execution condition for CHO with SCG needs to be optimized, or whether at least one parameter of the one or more CPAC execution conditions for CHO with candidate SCGs needs to be optimized; and transmitting, to a target MN, the analysis result.

[0035] In some implementations of the method and the target MN described herein, further comprising: receiving, from a further RAN node, first failure information.

[0036] In some implementations of the method and the target MN described herein, further comprising: receiving, from the UE of a further RAN node, second failure information.

[0037] In some implementations of the method and the target MN described herein, further comprising: generating an analysis result indicating at least one of: whether at least one parameter of the one or more CHO execution conditions for CHO with candidate SCGs needs to be optimized, or whether at least one parameter of the at least one CHO execution condition for CHO-only needs to be optimized, or whether at least one parameter of the at least one CHO execution condition for CHO with SCG needs to be optimized, or whether at least one parameter of the one or more CPAC execution conditions for CHO with candidate SCGs needs to be optimized.

[0038] In some implementations of the method and the source SN described herein, further comprising: receiving, from the source MN, an indication for determining or providing the

time related information.

[0039] In some implementations of the methods, the apparatuses described herein, the at least one time threshold comprises one of: a first time threshold associated with T304 trigger condition for a candidate target PCell, a second time threshold associated with T310 trigger condition for a source PCell, or a third time threshold associated with T312 trigger condition for a measurement identity of the candidate target PCell.

[0040] In some implementations of the methods, the apparatuses described herein, the at least one time threshold further comprises one of: a fourth time threshold associated with T304 trigger condition for a candidate target PSCell, a fifth time threshold associated with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell.

[0041] In some implementations of the methods, the apparatuses described herein, the at least one time threshold comprises: a seventh time threshold associated with a time duration between a time when the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled and a time when the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled.

[0042] In some implementations of the methods, the apparatuses described herein, the first information associated with the successful CHO with candidate SCGs procedure comprises one of: a cause value indicating that the first information associated with the successful CHO with candidate SCGs procedure is stored due to a fulfillment of the at least one trigger condition, a type of a first fulfilled execution condition for the CHO with candidate SCGs, a time duration between two fulfilled execution conditions for the CHO with candidate SCGs, a type indicating it is a CHO with candidate SCGs procedure, latest received one or more CHO execution conditions for the CHO with candidate SCGs, latest received one or more CAPC execution conditions for the CHO with candidate SCGs, latest radio measurement results of at least one neighbor cell, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs, a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, or a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell.

[0043] In some implementations of the methods, the apparatuses described herein, the first information is included in one of: a successful handover report (SHR) and a successful PSCell change report (SPR), or a successful handover with PSCell change report.

[0044] In some implementations of the methods, the apparatuses described herein, the second information comprises one of: a type of a first fulfilled execution condition for the CHO with candidate SCGs, latest received one or more CHO execution conditions for the CHO with candidate SCGs, latest received one or more CAPC execution conditions for the CHO with candidate SCGs, latest received at least one CHO execution condition for the CHO-only, latest received at least one CHO execution condition for the CHO with SCG, latest radio measurement results of at least one neighbor cell, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO-only, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs, a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, a list of candidate PCells configured for the CHO-only that are not within the at least one neighbor cell, or a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell.

[0045] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the second information further comprises one of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length between a third time and the second time, or a time length between the third time and the first time, wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, and wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled.

[0046] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the second information further comprises one of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length between a fourth time and the second time, or a time length between the fourth time and the first time, wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled, wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, and wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled.

[0047] In some implementations of the methods, the apparatuses described herein, the first failure information comprises one of: an ID of a source PCell, an ID of the first target PCell or the second target PCell, a type of a first fulfilled execution condition for the CHO with candidate SCGs, latest received one or more CHO execution conditions for the CHO with candidate SCGs, latest received one or more CAPC execution conditions for the CHO with candidate SCGs, latest received at least one CHO execution condition for the CHO-only, latest received at least one CHO execution condition for the CHO with SCG, latest radio measurement results of at least one neighbor cell, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO-only, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs, a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor

cell, a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, a list of candidate PCells configured for the CHO-only that are not within the at least one neighbor cell, a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell, or a failure type or an indication indicating that the CHO-only execution or the execution of CHO with SCG is failed.

[0048] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the first failure information further comprises one of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length between a third time and the second time, a time length between the third time and the first time, a time length between the first time and a fifth time, a time length between the second time and the fifth time, or a time length between the third time and the fifth time, wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled, wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled, and wherein the fifth time is a time when the CHO-only execution or the execution of CHO with SCG is failed.

[0049] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the first failure information further comprises one of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length

between a fourth time and the second time, a time length between the fourth time and the first time, a time length between the first time and a fifth time, a time length between the second time and the fifth time, or a time length between the fourth time and the fifth time, wherein the first time is a time the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled, wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, and wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled, and wherein the fifth time is a time when the CHO-only execution or the execution of CHO with SCG is failed.

[0050] In some implementations of the methods, the apparatuses described herein, the second failure information comprises one of: an ID of a source PSCell, an ID of the target PSCell associated with the second target PCell, a type of a first fulfilled execution condition for the CHO with candidate SCGs, latest received one or more CHO execution conditions for the CHO with candidate SCGs, latest received one or more CAPC execution conditions for the CHO with candidate SCGs, latest received at least one CHO execution condition for the CHO with SCG, latest radio measurement results of at least one neighbor cell, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs, a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell, or a failure type or an indication indicating that the CHO-only execution or the execution of CHO with SCG is failed.

[0051] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the second failure information further comprises one of: an ID indicating a candidate PCell and an ID of a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO execution conditions for CHO with candidate SCGs, and the

candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length between a third time and the second time, a time length between the third time and the first time, a time length between the first time and a sixth time, a time length between the second time and the sixth time, or a time length between the third time and the sixth time, wherein the first time is a time when the at least one CHO execution condition for CHO with SCG is fulfilled, wherein the second time is a time when the first configuration or the fourth configuration is received, wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled, and wherein the sixth time is a time when the access to the target PSCell associated with the second target PCell is failed.

[0052] In some implementations of the methods, the apparatuses described herein, the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the second failure information further comprises one of: an ID indicating a candidate PCell and an ID of a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs, a time length between a first time and a second time, a time length between a fourth time and the second time, a time length between the fourth time and the first time, a time length between the first time and a sixth time, a time length between the second time and the sixth time, or a time length between the fourth time and the sixth time, wherein the first time is a time the at least one CHO execution condition for CHO with SCG is fulfilled, wherein the second time is a time when the first configuration or the fourth configuration is received, and wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled, and wherein the sixth time is a time when the access to the target PSCell associated with the second target PCell is failed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053] FIG. 1 illustrates an example of a wireless communications system in which some embodiments of the present disclosure can be implemented;

[0054] FIG. 2 illustrates a schematic diagram of an example communication network in which some embodiments of the present disclosure can be implemented;

[0055] FIG. 3 illustrates an example process of CHO with candidate SCGs;

[0056] FIG. 4 illustrates a signalling chart illustrating a communication process in accordance with some example embodiments of the present disclosure;

[0057] FIG. 5 illustrates a signalling chart illustrating a communication process in accordance with some example embodiments of the present disclosure;

[0058] FIGS. 6A-6D illustrate some example timing schematic diagrams in accordance with some example embodiments of the present disclosure;

[0059] FIG. 7 illustrates an example of a device that is suitable for implementing embodiments of the present disclosure;

[0060] FIG. 8 illustrates an example of a processor that is suitable for implementing some embodiments of the present disclosure;

[0061] FIG. 9 illustrates a flowchart of an example method implemented at a UE in accordance with aspects of the present disclosure;

[0062] FIG. 10 illustrates a flowchart of an example method implemented at a source MN in accordance with aspects of the present disclosure;

[0063] FIG. 11 illustrates a flowchart of an example method implemented at a target MN in accordance with aspects of the present disclosure; and

[0064] FIG. 12 illustrates a flowchart of an example method implemented at a source SN in accordance with some embodiments of the present disclosure.

[0065] Throughout the drawings, the same or similar reference numerals represent the same or similar element.

DETAILED DESCRIPTION

[0066] Principles of the present disclosure will now be described with reference to some embodiments. It is to be understood that these embodiments are described only for the purpose of illustration and help those skilled in the art to understand and implement the present disclosure, without suggesting any limitation as to the scope of the disclosure. The disclosure described herein can be implemented in various manners other than the ones described below. In the following description and claims, unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skills in the art to which this disclosure belongs.

[0067] References in the present disclosure to "one embodiment," "an example embodiment," "an embodiment," "some embodiments," and the like indicate that the embodiment(s) described may include a particular feature, structure, or characteristic, but it is not necessary that every embodiment includes the particular feature, structure, or characteristic. Moreover, such phrases do not necessarily refer to the same embodiment(s). Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described.

[0068] It shall be understood that although the terms "first" and "second" or the like may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another element. For example, a first element could also be termed as a second element, and similarly, a second element could also be termed as a first element, without departing from the scope of embodiments. As used herein, the term "and/or" includes any and all combinations of one or more of the listed terms. In some examples, values, procedures, or apparatuses are referred to as "best," "lowest," "highest," "minimum," "maximum," or the like. It will be appreciated that such descriptions are intended to indicate that a selection among many used functional alternatives can be made, and such selections need not be better, smaller, higher, or otherwise preferable to other selections.

[0069] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of embodiments. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," "comprising," "has," "having," "includes" and/or "including," when used herein, specify the presence of stated features, elements, components and/or the like, but do not preclude the presence or addition of one or more other features, elements, components and/or combinations thereof. For example, the term "includes" and its variants are to be read as open terms that mean "includes, but is not limited to." The term "based on" is to be read as "based at least in part on." The term "one embodiment" and "an embodiment" are to be read as "at least one embodiment." The term "another embodiment" is to be read as "at least one other embodiment." The use of an expression such as "A and/or B" can mean either "only A" or "only B" or "both A and B." Other definitions, explicit and implicit, may be included below.

[0070] FIG. 1 illustrates an example of a wireless communications system 100 in which some embodiments of the present disclosure can be implemented. The wireless communications system 100 may include one or more network entities 102 (also referred to as network equipment (NE)), one or more UEs 104, a core network 106, and a packet data network 108. The wireless communications system 100 may support various radio access technologies. In some implementations, the wireless communications system 100 may be a 4G network, such as a long term evolution (LTE) network or an LTE-Advanced (LTE-A) network. In some other implementations, the wireless communications system 100 may be a 5G network, such as a new radio (NR) network. In other implementations, the wireless communications system 100 may be a combination of a 4G network and a 5G network, or other suitable radio access technology including Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20. The wireless communications system 100 may support radio access technologies beyond 5G. Additionally, the wireless communications system 100 may support technologies, such as time division multiple access (TDMA), frequency division multiple access (FDMA), or code division multiple access (CDMA), etc.

[0071] The one or more network entities 102 may be dispersed throughout a geographic region to form the wireless communications system 100. One or more of the network entities 102 described herein may be or include or may be referred to as a network node, a base station, a network element, a radio access network (RAN), a base transceiver station, an access point, a NodeB, an eNodeB (eNB), a next-generation NodeB (gNB), or other suitable terminology. A network entity 102 and a UE 104 may communicate via a communication link 110, which may be a wireless or wired connection. For example, a network entity 102 and a UE 104 may perform wireless communication (e.g., receive signaling, transmit signaling) over a Uu interface.

[0072] A network entity 102 may provide a geographic coverage area 112 for which the network entity 102 may support services (e.g., voice, video, packet data, message, broadcast, etc.) for one or more UEs 104 within the geographic coverage area 112. For example, a network entity 102 and a UE 104 may support wireless communication of signals related to services (e.g., voice, video, packet data, message, broadcast, etc.) according to one or multiple radio access technologies. In some implementations, a network entity 102 may be moveable, for example, a satellite associated with a non-terrestrial network. In some implementations, different geographic coverage areas 112 associated with the same or

different radio access technologies may overlap, but the different geographic coverage areas 112 may be associated with different network entities 102. Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0073] The one or more UEs 104 may be dispersed throughout a geographic region of the wireless communications system 100. A UE 104 may include or may be referred to as a mobile device, a wireless device, a remote device, a remote unit, a handheld device, or a subscriber device, or some other suitable terminology. In some implementations, the UE 104 may be referred to as a unit, a station, a terminal, or a client, among other examples. Additionally, or alternatively, the UE 104 may be referred to as an Internet-of-Things (IoT) device, an Internet-of-Everything (IoE) device, or machine-type communication (MTC) device, among other examples. In some implementations, a UE 104 may be stationary in the wireless communications system 100. In some other implementations, a UE 104 may be mobile in the wireless communications system 100.

[0074] The one or more UEs 104 may be devices in different forms or having different capabilities. Some examples of UEs 104 are illustrated in FIG. 1. A UE 104 may be capable of communicating with various types of devices, such as the network entities 102, other UEs 104, or network equipment (e.g., the core network 106, the packet data network 108, a relay device, an integrated access and backhaul (IAB) node, or another network equipment), as shown in FIG. 1. Additionally, or alternatively, a UE 104 may support communication with other network entities 102 or UEs 104, which may act as relays in the wireless communications system 100.

[0075] A UE 104 may also be able to support wireless communication directly with other UEs 104 over a communication link 114. For example, a UE 104 may support wireless communication directly with another UE 104 over a device-to-device (D2D) communication link. In some implementations, such as vehicle-to-vehicle (V2V) deployments, vehicle-to-everything (V2X) deployments, or cellular-V2X deployments, the communication link 114 may be referred to as a sidelink (SL). For example, a UE 104 may support wireless communication directly with another UE 104 over a PC5 interface.

[0076] A network entity 102 may support communications with the core network 106, or with another network entity 102, or both. For example, a network entity 102 may interface with the core network 106 through one or more backhaul links 116 (e.g., via an S1, N2, N3, or another network interface). The network entities 102 may communicate with each other over the backhaul links 116 (e.g., via an X2, Xn, or another network interface). In some implementations, the network entities 102 may communicate with each other directly (e.g., between the network entities 102). In some other implementations, the network entities 102 may communicate with each other or indirectly (e.g., via the core network 106). In some implementations, one or more network entities 102 may include subcomponents, such as an access network entity, which may be an example of an access node controller (ANC). An ANC may communicate with the one or more UEs 104 through one or more other access network transmission entities, which may be referred to as a radio heads, smart radio heads, or transmission-reception points (TRPs).

[0077] In some implementations, a network entity 102 may be configured in a disaggregated architecture, which may be configured to utilize a protocol stack physically or logically distributed among two or more network entities 102, such as an integrated access backhaul (IAB) network, an open RAN (O-RAN) (e.g., a network configuration sponsored by the O-RAN Alliance), or a virtualized RAN (vRAN) (e.g., a cloud RAN (C-RAN)). For example, a network entity 102 may include one or more of a central unit (CU), a distributed unit (DU), a radio unit (RU), a RAN Intelligent Controller (RIC) (e.g., a Near-Real Time RIC (Near-RT RIC), a Non-Real Time RIC (Non-RT RIC)), a Service Management and Orchestration (SMO) system, or any combination thereof.

[0078] An RU may also be referred to as a radio head, a smart radio head, a remote radio head (RRH), a remote radio unit (RRU), or a transmission reception point (TRP). One or more components of the network entities 102 in a disaggregated RAN architecture may be co-located, or one or more components of the network entities 102 may be located in distributed locations (e.g., separate physical locations). In some implementations, one or more network entities 102 of a disaggregated RAN architecture may be implemented as virtual units (e.g., a virtual CU (VCU), a virtual DU (VDU), a virtual RU (VRU)).

[0079] Split of functionality between a CU, a DU, and an RU may be flexible and may support different functionalities depending upon which functions (e.g., network layer functions, protocol layer functions, baseband functions, radio frequency functions, and any combinations thereof) are performed at a CU, a DU, or an RU. For example, a functional

split of a protocol stack may be employed between a CU and a DU such that the CU may support one or more layers of the protocol stack and the DU may support one or more different layers of the protocol stack. In some implementations, the CU may host upper protocol layer (e.g., a layer 3 (L3), a layer 2 (L2)) functionality and signaling (e.g., Radio Resource Control (RRC), service data adaption protocol (SDAP), Packet Data Convergence Protocol (PDCP)). The CU may be connected to one or more DUs or RUs, and the one or more DUs or RUs may host lower protocol layers, such as a layer 1 (L1) (e.g., physical (PHY) layer) or an L2 (e.g., radio link control (RLC) layer, medium access control (MAC) layer) functionality and signaling, and may each be at least partially controlled by the CU.

[0080] Additionally, or alternatively, a functional split of the protocol stack may be employed between a DU and an RU such that the DU may support one or more layers of the protocol stack and the RU may support one or more different layers of the protocol stack. The DU may support one or multiple different cells (e.g., via one or more RUs). In some implementations, a functional split between a CU and a DU, or between a DU and an RU may be within a protocol layer (e.g., some functions for a protocol layer may be performed by one of a CU, a DU, or an RU, while other functions of the protocol layer are performed by a different one of the CU, the DU, or the RU).

[0081] A CU may be functionally split further into CU control plane (CU-CP) and CU user plane (CU-UP) functions. A CU may be connected to one or more DUs via a midhaul communication link (e.g., F1, F1-C, F1-U), and a DU may be connected to one or more RUs via a fronthaul communication link (e.g., open fronthaul (FH) interface). In some implementations, a midhaul communication link or a fronthaul communication link may be implemented in accordance with an interface (e.g., a channel) between layers of a protocol stack supported by respective network entities 102 that are in communication via such communication links.

[0082] The core network 106 may support user authentication, access authorization, tracking, connectivity, and other access, routing, or mobility functions. The core network 106 may be an evolved packet core (EPC), or a 5G core (5GC), which may include a control plane entity that manages access and mobility (e.g., a mobility management entity (MME), an access and mobility management functions (AMF)) and a user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a Packet Data Network (PDN) gateway (P-GW), or a user plane function (UPF)). In some implementations, the control plane entity may manage non-access stratum (NAS) functions,

such as mobility, authentication, and bearer management (e.g., data bearers, signal bearers, etc.) for the one or more UEs 104 served by the one or more network entities 102 associated with the core network 106.

[0083] The core network 106 may communicate with the packet data network 108 over one or more backhaul links 116 (e.g., via an S1, N2, N3, or another network interface). The packet data network 108 may include an application server 118. In some implementations, one or more UEs 104 may communicate with the application server 118. A UE 104 may establish a session (e.g., a protocol data unit (PDU) session, or the like) with the core network 106 via a network entity 102. The core network 106 may route traffic (e.g., control information, data, and the like) between the UE 104 and the application server 118 using the established session (e.g., the established PDU session). The PDU session may be an example of a logical connection between the UE 104 and the core network 106 (e.g., one or more network functions of the core network 106).

[0084] In the wireless communications system 100, the network entities 102 and the UEs 104 may use resources of the wireless communications system 100 (e.g., time resources (e.g., symbols, slots, subframes, frames, or the like) or frequency resources (e.g., subcarriers, carriers)) to perform various operations (e.g., wireless communications). In some implementations, the network entities 102 and the UEs 104 may support different resource structures. For example, the network entities 102 and the UEs 104 may support different frame structures. In some implementations, such as in 4G, the network entities 102 and the UEs 104 may support a single frame structure. In some other implementations, such as in 5G and among other suitable radio access technologies, the network entities 102 and the UEs 104 may support various frame structures (i.e., multiple frame structures). The network entities 102 and the UEs 104 may support various frame structures based on one or more numerologies.

[0085] One or more numerologies may be supported in the wireless communications system 100, and a numerology may include a subcarrier spacing and a cyclic prefix. A first numerology (e.g., $\mu=0$) may be associated with a first subcarrier spacing (e.g., 15 kHz) and a normal cyclic prefix. In some implementations, the first numerology (e.g., $\mu=0$) associated with the first subcarrier spacing (e.g., 15 kHz) may utilize one slot per subframe. A second numerology (e.g., $\mu=1$) may be associated with a second subcarrier spacing (e.g., 30 kHz) and a normal cyclic prefix. A third numerology (e.g., $\mu=2$) may be associated with a third subcarrier spacing (e.g., 60 kHz) and a normal cyclic prefix or an extended cyclic

prefix. A fourth numerology (e.g., μ=3) may be associated with a fourth subcarrier spacing (e.g., 120 kHz) and a normal cyclic prefix. A fifth numerology (e.g., μ=4) may be associated with a fifth subcarrier spacing (e.g., 240 kHz) and a normal cyclic prefix.

[0086] A time interval of a resource (e.g., a communication resource) may be organized according to frames (also referred to as radio frames). Each frame may have a duration, for example, a 10 millisecond (*ms*) duration. In some implementations, each frame may include multiple subframes. For example, each frame may include 10 subframes, and each subframe may have a duration, for example, a 1 *ms* duration. In some implementations, each frame may have the same duration. In some implementations, each subframe of a frame may have the same duration.

[0087] Additionally or alternatively, a time interval of a resource (e.g., a communication resource) may be organized according to slots. For example, a subframe may include a number (e.g., quantity) of slots. The number of slots in each subframe may also depend on the one or more numerologies supported in the wireless communications system 100. For instance, the first, second, third, fourth, and fifth numerologies (i.e., μ=0, μ=1, μ=2, μ=3, μ=4) associated with respective subcarrier spacings of 15 kHz, 30 kHz, 60 kHz, 120 kHz, and 240 kHz may utilize a single slot per subframe, two slots per subframe, four slots per subframe, eight slots per subframe, and 16 slots per subframe, respectively. Each slot may include a number (e.g., quantity) of symbols (e.g., OFDM symbols). In some implementations, the number (e.g., quantity) of slots for a subframe may depend on a numerology. For a normal cyclic prefix, a slot may include 14 symbols. For an extended cyclic prefix (e.g., applicable for 60 kHz subcarrier spacing), a slot may include 12 symbols. The relationship between the number of symbols per slot, the number of slots per subframe, and the number of slots per frame for a normal cyclic prefix and an extended cyclic prefix may depend on a numerology. It should be understood that reference to a first numerology (e.g., μ=0) associated with a first subcarrier spacing (e.g., 15 kHz) may be used interchangeably between subframes and slots.

[0088] In the wireless communications system 100, an electromagnetic (EM) spectrum may be split, based on frequency or wavelength, into various classes, frequency bands, frequency channels, etc. By way of example, the wireless communications system 100 may support one or multiple operating frequency bands, such as frequency range designations FR1 (410 MHz – 7.125 GHz), FR2 (24.25 GHz – 52.6 GHz), FR3 (7.125 GHz – 24.25 GHz), FR4 (52.6 GHz – 114.25 GHz), FR4a or FR4-1 (52.6 GHz – 71 GHz), and FR5 (114.25 GHz –

300 GHz). In some implementations, the network entities 102 and the UEs 104 may perform wireless communications over one or more of the operating frequency bands. In some implementations, FR1 may be used by the network entities 102 and the UEs 104, among other equipment or devices for cellular communications traffic (e.g., control information, data). In some implementations, FR2 may be used by the network entities 102 and the UEs 104, among other equipment or devices for short-range, high data rate capabilities.

[0089] FR1 may be associated with one or multiple numerologies (e.g., at least three numerologies). For example, FR1 may be associated with a first numerology (e.g., $\mu=0$), which includes 15 kHz subcarrier spacing; a second numerology (e.g., $\mu=1$), which includes 30 kHz subcarrier spacing; and a third numerology (e.g., $\mu=2$), which includes 60 kHz subcarrier spacing. FR2 may be associated with one or multiple numerologies (e.g., at least 2 numerologies). For example, FR2 may be associated with a third numerology (e.g., $\mu=2$), which includes 60 kHz subcarrier spacing; and a fourth numerology (e.g., $\mu=3$), which includes 120 kHz subcarrier spacing.

[0090] CHO is defined as a handover that is executed by the UE when one or more handover execution conditions are met. The UE starts evaluating the execution condition(s) upon receiving the CHO configuration, and stops evaluating the execution condition(s) once a handover is executed. The following principles may apply to CHO: The CHO configuration contains the configuration of CHO candidate target cell(s) generated by the candidate target gNB(s) and execution condition(s) generated by the source gNB. An execution condition may consist of one or two trigger condition(s) (e.g., CHO events A3/A4/A5, CondEvent A3/A4/A5). An execution condition can be called as a CHO execution condition. For one candidate target cell, one CHO execution condition can be configured. Only single RS type is supported and at most two different trigger quantities (e.g. RSRP and RSRQ, RSRP and SINR, etc.) can be configured simultaneously for the evaluation of CHO execution condition of a single candidate target cell. When one or more CHO execution conditions are fulfilled, the UE can select a candidate target cell whose CHO execution condition is fulfilled as a target cell, and perform a CHO execution towards or to the target cell, e.g., synchronization with the target cell and/or access to the target cell. While executing CHO, i.e. from the time when the UE starts synchronization with target cell, UE does not monitor source cell.

[0091] CPAC may mean a conditional PSCell addition (CPA) or a conditional PSCell change (CPC) procedure in any MR-DC cases, which include NR-NR DC, EN DC, NGEN-DC, NE-DC.

[0092] CPA: MN could initiate CPA procedure by sending SN addition request to multiple candidate target SNs. In the SN addition request message, MN could indicate a list of cells that could be used as PSCell, e.g. cell 1, 2, 3, ... 10. Candidate target SNs selects a number of cells from the list of cells provided by the MN to be prepared as candidate PSCells, e.g. cell 1, 2, 3, ... 5. Candidate target SN will then reply SN addition request acknowledge containing RRC reconfiguration message that provides UE with SN RRC reconfiguration to be used upon execution of CPA and access to the corresponding target SN. MN generates a MN RRC reconfiguration message containing a RRC conditional reconfiguration element that consists of CPA execution condition (generated by the MN) and SN RRC reconfiguration message (generated by the candidate target SN). For example, CPA execution condition may consist of one or two trigger condition(s) (e.g., CHO events B1/A4, CondEvent B1/A4). For one candidate PSCell, one CPA execution condition can be configured. MN sends the generated MN RRC reconfiguration message to a UE. Upon receiving the CPA related RRC reconfiguration message, UE starts evaluating if the CPA execution condition is fulfilled (e.g. if the measured radio link quality of one candidate target SN is better than a threshold). Upon the fulfillment of the CPA execution condition, the UE can select a candidate PSCell whose CPA execution condition is fulfilled as a target PSCell, and perform a CPA execution towards or to the target PSCell, e.g. UE starts accessing the corresponding target PSCell or target SN.

[0093] Inter-SN CPC: Inter-SN CPC can be either initiated by the MN or the source SN. Source SN could initiate the inter-SN CPC by sending a SN change required message to MN containing inter-SN CPC related information. Upon receiving the SN change required message triggering inter-SN CPC, or MN initiating inter-SN CPC, MN sends SN addition request to multiple candidate target SNs. Candidate target SNs may reply SN addition request acknowledge containing RRC reconfiguration message that provides UE with SN RRC reconfiguration to be used upon execution of CPC and access to the corresponding target SN. The MN RRC reconfiguration message containing an RRC conditional reconfiguration element that consists of CPC execution condition and SN RRC reconfiguration message is sent to a UE. For example, CPC execution condition may consist of one or two trigger condition(s) (e.g., CHO events B1/A3/A4/A5, CondEvent B1 A3/A4/A5). For one candidate PSCell, one CPC execution condition can be configured. Upon receiving the CPC related RRC reconfiguration message, UE starts evaluating if the CPC execution condition is fulfilled (e.g. if the measured radio link quality of one candidate

target SN is better than a threshold). Upon the fulfillment of the CPC execution condition, the UE can select a candidate PSCell whose CPC execution condition is fulfilled as a target PSCell, and perform a CPC execution towards or to the target PSCell, e.g. UE starts accessing the corresponding target SN.

[0094] One objective for mobility enhancements is to specify a CHO with candidate SCG(s) procedure (i.e. to specify a CHO with CPAC procedure, or to specify CHO including (candidate) target MCG and candidate SCG(s) for CPC/CPA). The UE evaluates whether CHO execution condition(s) and CPC/CPA execution condition(s) are fulfilled, when both conditions are met, the UE performs CHO execution and CPAC execution. To improve mobility robustness, self-organizing network (SON) enhancements for the CHO with candidate SCGs should be considered.

[0095] Embodiments of the present disclosure provide a solution for CHO with candidate SCGs. In the solution, a UE may receive a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs. In some examples, the UE may receive a second configuration comprising at least one time threshold, the at least one time threshold is used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure. In some examples, if at least one trigger condition associated with the at least one time threshold is fulfilled, the UE may store or report the first information associated with the successful CHO with candidate SCGs procedure. Principles and implementations of the present disclosure will be described in detail below with reference to the figures.

[0096] FIG. 2 illustrates a schematic diagram of an example communication network 200 in which some embodiments of the present disclosure can be implemented. As shown in FIG. 2, the communication network 200 may include a RAN node 210, a RAN node 220, a RAN node 215, a RAN node 225, and a UE 230.

[0097] In a scenario that a handover may be trigger or performed, the RAN node 210 may be referred to as a source master node (MN) 210 and the RAN node 220 may be referred to as a source secondary node (SN) 220, the RAN node 215 may be referred to as a candidate target MN 215 and the RAN node 225 may be referred to as a candidate target SN 225. It is understood that if a candidate target PCell provided by the candidate target MN 215 is selected as a target PCell, then the candidate target MN 215 is a target MN (T-MN) 215, if a

candidate target PSCell provided by the candidate target SN 225 is selected as a target PSCell, then the candidate target SN 225 is a target SN (T-SN) 225.

[0098] Some scenarios can be considered for a CHO with candidate SCG(s) procedure. In the present disclosure, the term "CHO with candidate SCG(s)" may also be called as CHO with candidate SCGs, CHO with one or more candidate SCGs, CHO with at least one candidate SCG, CHO with multiple candidate SCGs, CHO with CPAC, CHO with (candidate) target MCG and candidate target SCG(s) for CPC/CPA, CHO including (candidate) target MCG and candidate target SCG(s) configuration, or the like, the present disclosure does not limit this aspect. For example, in some example embodiments discussed below, the term "CHO with candidate SCGs" is used for ease of description.

[0099] In some examples, a scenario may a CHO with CPA: CHO from single connectivity to an MRDC connection, e.g., CHO from source PCell 1 to candidate target PCell 2 with candidate target SN(s). With reference to FIG. 2, the UE 230 may initially in PCell 1 provided by the source MN (S-MN) 210, and later performs CHO execution to PCell 2 provided by the T-MN 215 whose CHO execution condition is fulfilled, and also performs CPA execution to the T-SN 225 which may provide a target PSCell whose CPA execution condition is fulfilled.

[00100] In some examples, a scenario may a CHO with intra-SN CPC: CHO from source PCell 1 with SCG 1 in SN 1 to candidate target PCell 2 with candidate target SCG(s) in the same SN 1. For example, the UE 230 may initially in PCell 1 provided by the source MN (S-MN) 210 and PSCell 1 provided by the source SN (S-SN) 220, and later performs CHO execution to PCell 2 provided by the T-MN 215 whose CHO execution condition is fulfilled, and also performs CPC execution to a target PSCell provided by the source SN 220 whose CPC execution condition is fulfilled.

[00101] In some examples, a scenario may a CHO with inter-SN CPC: CHO from source PCell 1 (e.g. managed by S-MN) with SN 1 (e.g. S-SN) to candidate target PCell 2 (e.g. managed by T-MN) with candidate target SN(s) other than SN1 (e.g. T-SN). With reference to FIG. 2, the UE 230 may initially in PCell 1 provided by the source MN (S-MN) 210 and PSCell 1 provided by the source SN (S-SN) 220, and later performs CHO execution to PCell 2 provided by the T-MN 215 whose CHO execution condition is fulfilled, and also performs CPC execution to a target PSCell provided by the target SN (T-SN) 225 whose CPC execution condition is fulfilled associated with the T-SN 225 which may provide PSCell 2.

[00102] It is to be understood that the numbers of devices and their connection relationships and types shown in FIG. 2 are only for the purpose of illustration without suggesting any limitation. The environment may include any suitable numbers of devices adapted for implementing embodiments of the present disclosure. For example, one or more other candidate target MNs and one or more other candidate target SNs may further be included.

[00103] FIG. 3 illustrates an example successful process 300 of CHO with candidate SCGs. CHO configuration referring to or including CPC/CPA configuration can be supported in a CHO with candidate SCGs procedure. In a CHO with candidate SCGs procedure, one or more candidate PCells, and, one or more candidate PSCells can be configured to the UE, also, one or more CHO execution conditions for CHO with candidate SCG(s), and, one or more CPAC execution conditions for CHO with candidate SCG(s)can be configured to the UE, wherein, one candidate PCell is associated with a CHO execution condition for CHO with candidate SCG(s), and, one candidate PSCell is associated with a CPAC execution condition for CHO with candidate SCG(s). CHO execution condition(s) evaluation and CPC/CPA execution condition(s) evaluation can be concurrent/simultaneously performed by the UE. For example, the UE starts, at step 9 in FIG. 3, evaluation of the one or more CHO execution conditions and evaluation of the one or more CPA/CPC execution conditions at the same time (e.g. when receiving the configuration for the CHO with candidate SCGs procedure).

[00104] The CHO execution conditions (for candidate PCells) and CPA/CPC execution conditions (for candidate PSCells) are provided based on the source MeasConfig. For CHO execution conditions, the source MN 210 determines the one or more CHO execution conditions for one or more candidate PCells (e.g. CondEvent B1/A3/A5), based on the source MCG MeasConfig. For CPA/CPC execution conditions, the candidate MN 215 determines the parameters of the one or more CPAC execution conditions for one or more candidate PSCells (e.g. CondEvent B1/A3/A4/A5 threshold). The candidate MN 215 informs the source MN 210 about the prepared candidate PSCells and parameters of the associated CPA/CPC execution conditions (e.g. CondEvent B1/A3/A4/A5 threshold). According to the received information from the candidate MN 215, the source MN 210 generates the corresponding CPAC execution conditions.

[00105] For CHO with candidate SCGs for CPA/CPC, the RRCReconfiguration message in one CHO container includes one MCG configuration and one SCG configuration (i.e. similar to signalling structure for Rel-17 CHO with SCG configuration). The execution conditions associated with one CHO container includes both CHO execution condition(s) and CPA/CPC

execution condition(s), i.e. triggering conditions associated with both candidate PCell(s) and candidate PSCell(s). In another word, in a CHO with candidate SCGs procedure, at least one MCG configuration for at least one candidate PCell, at least one SCG configuration for at least one candidate PSCells, at least one CHO execution condition for at least one candidate PCell for CHO with candidate SCG(s), and, at least one CPAC execution condition for at least one candidate PSCell for CHO with candidate SCG(s) can be configured to the UE.

[00106] If there are multiple candidate PSCells associated with one candidate PCell, the NW can provide multiple CHO configurations for the same candidate PCell, i.e. each one contains one MCG configuration (for the same candidate PCell) and one SCG configuration (for each candidate PSCell within the candidate PSCells).

[00107] When one CPA/CPC execution condition is met but no CHO execution condition is met, the UE 230 continues to evaluate both CHO execution conditions and CPA/CPC execution conditions. The UE doesn't execute CPC/CPA unless CHO execution condition is fulfilled.

[00108] For a CHO with candidate SCGs procedure, when both CHO execution conditions and CPAC execution conditions are met, CHO execution and CPAC execution can be performed. In a CHO with candidate SCGs procedure, to handle the case that CHO execution conditions for CHO with candidate SCG(s) or CPAC execution conditions for CHO with candidate SCG(s) are not met, besides configurations for CHO with candidate SCG(s) (i.e. configurations for CHO with candidate SCG(s) include at least one MCG configuration for at least one candidate PCell, at least one SCG configuration for at least one candidate PSCells, at least one CHO execution condition for at least one candidate PCell for CHO with candidate SCG(s), and at least one CPAC execution condition for at least one candidate PSCell for CHO with candidate SCG(s)), configurations for CHO-only and/or configurations for Rel-17 CHO with SCG can be configured to the UE. For example, configurations for CHO-only include at least one MCG configuration for at least one candidate PCell (wherein the candidate PCell for CHO-only may be same or different with the candidate PCell for CHO with candidate SCG(s)), and at least one CHO execution condition for at least one candidate PCell for CHO-only. For example, configurations for Rel-17 CHO with SCG include at least one MCG configuration for at least one candidate PCell (wherein the candidate PCell for Rel-17 CHO with SCG may be same or different with the candidate PCell for CHO with candidate SCG(s)), at least one CHO execution condition for at least one candidate PCell for CHO with SCG, and at least one SCG configuration for

at least one target PSCell (wherein for each candidate PCell for CHO with SCG, one target PSCell is configured). When one CHO execution condition for CHO with candidate SCG(s) is met but no CPC execution condition for CHO with candidate SCG(s) is met, or when one CPAC execution condition for CHO with candidate SCG(s) is met but no CHO execution condition for CHO with candidate SCG(s) is met, if there is an available CHO-only or Rel-17 CHO with SCG configuration for which the CHO execution condition is met, e.g. if there is a candidate PCell whose CHO execution condition for CHO-only is fulfilled, or if there is a candidate PCell whose CHO execution condition for Rel-17 CHO with SCG is fulfilled, the UE performs CHO-only execution (e.g. the UE handover or access to the candidate PCell whose CHO execution condition for CHO-only is fulfilled) or performs an execution of Rel-17 CHO with SCG (e.g. the UE handover or access to the candidate PCell whose CHO execution condition for Rel-17 CHO with SCG is fulfilled, also the UE performs PSCell addition or PSCell change or access to the target PSCell associated with the candidate PCell), and THUS the network can handle such situation by providing proper configurations).

[00109] Reference is further made to FIG. 4, which illustrates a signalling chart illustrating communication process 400 in accordance with some example embodiments of the present disclosure. The process 400 may involve a source MN 210 and a UE 230.

[00110] In the process 400, the source MN 210 transmits, at 410, a first configuration to the UE 230. In some implementations, the first configuration is used for CHO with candidate SCGs, e.g. which can be called as configurations for CHO with candidate SCG(s) as mentioned above. The first configuration may include one or more CHO execution conditions for CHO with candidate SCG(s) and one or more CPAC execution conditions for CHO with candidate SCG(s).

[00111] In some example embodiments, for each candidate (target) PCell, the source MN 210 may configure a corresponding CHO execution condition for CHO with candidate SCG(s), which may consist of one or two trigger conditions, such as CondEvent A3/A4/A5. In some example embodiments, for each candidate (target) PSCell, a corresponding candidate target MN may provide parameters of a CPAC execution condition to the source MN 210, and the source MN 210 then generate and transmit the one or more CPAC execution conditions for CHO with candidate SCG(s) to the UE 230 in the first configuration.

[00112] In some examples, the first configuration may indicate a first candidate (target) PCell and an associated first candidate (target) PSCell, where the first candidate (target) PCell

may be associated with a first CHO execution condition and the first candidate (target) PSCell may be associated with a first CPAC execution condition. In some examples, the first configuration may indicate a second candidate (target) PCell and an associated second candidate (target) PSCell, where the second candidate (target) PCell may be associated with a second CHO execution condition and the second candidate (target) PSCell may be associated with a second CPAC execution condition. It is to be understood that the number of candidate (target) PCells indicated by the first configuration is not limited in the present disclosure, and the number of candidate (target) PSCells indicated by the first configuration is not limited in the present disclosure.

[00113] In the process 400, the source MN 210 transmits, at 420, a second configuration to the UE 230, where the second configuration include at least one time threshold. The at least one time threshold may be used for determining whether at least one trigger condition for storing or reporting a successful CHO with candidate SCGs procedure is fulfilled. Or, the at least one time threshold may be used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure.

[00114] In some implementations, the source MN 210 transmits the first configuration and the second configuration to the UE 230 via a same message or different messages separately.

[00115] In some implementations, the second configuration may include at least one of: a first time threshold, a second threshold, a third threshold, a fourth threshold, a fifth threshold, a sixth threshold, or a seventh threshold, which are discussed in detail below. For example, the second configuration may include at least one: a first time threshold, a second threshold, or a third threshold; and the second configuration may further include at least one of: a fourth threshold, a fifth threshold, or a sixth threshold. For example, the second configuration may include a seventh time threshold, which may be represented as Tth.

[00116] In some example embodiments, the UE 230 may evaluate whether the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled, and evaluate whether the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled, e.g., upon receiving the first configuration.

[00117] In some implementations, it is assumed that the UE 230 determines that a CHO execution condition for CHO with candidate SCGs and an associated CPAC execution condition for CHO with candidate SCGs are fulfilled, for example, a first candidate (target) PCell satisfied its related CHO execution condition for CHO with candidate SCGs, and a first

candidate (target) PSCell satisfied its related CPAC execution condition for CHO with candidate SCGs, where the first candidate (target) PCell is associated with the first candidate (target) PSCell. Then, the UE may handover or access to the first candidate (target) PCell (which can be called as target PCell), and the UE may perform PSCell addition or PSCell change or access to the first candidate (target) PSCell (which can be called as target PSCell).

[00118] From certain perspective, the CHO with candidate SCGs procedure is successful, i.e., a successful CHO with candidate SCGs procedure, e.g., the UE handover or access to the first candidate (target) PCell (which can be called as target PCell) successfully, and the UE may perform PSCell addition or PSCell change or access to the first candidate (target) PSCell (which can be called as target PSCell) successfully. However, it may be a near failure successful CHO with candidate SCGs procedure.

[00119] In some implementations, after receiving the second configuration, the UE 230 may determine whether a trigger condition is met (or fulfilled). In some examples, the trigger condition is a trigger condition for a successful report of CHO with candidate SCGs, it is to be understood that the following description will use "the trigger condition" for brevity. In some examples, the trigger condition is associated with at least one time threshold, i.e., at least one time related threshold.

[00120] In some implementations, the trigger condition may be used by the UE 230 to determine whether to log or store first information which is related with a near failure successful CHO with candidate SCGs procedure.

[00121] In some implementations, the trigger condition may be a new trigger condition. In some examples, the new trigger condition is introduced for a successful report for CHO with candidate SCGs. In some examples, the trigger condition may be associated with a seventh time threshold (or a time related threshold), i.e., Tth.

[00122] In some examples, the trigger condition fulfills may mean that a time duration between a time when the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled and a time when the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled is equal to or exceeds the time threshold Tth. For example, a time duration between two fulfilled execution conditions is equal to higher than the time threshold Tth. For example, the time duration may be: a time elapsed since a CHO execution condition for CHO with candidate SCGs is fulfilled until a CPAC execution condition for CHO with candidate SCGs is fulfilled, or a time elapsed since a CPAC

execution condition for CHO with candidate SCGs is fulfilled until a CHO execution condition for CHO with candidate SCGs is fulfilled.

[00123] In some example embodiments, the second configuration from the source MN 210 may be included in a message, where the message may be an RRC reconfiguration message. In some examples, the first configuration and the second configuration may be in a same message (such as the RRC reconfiguration message) or may be in different messages.

[00124] In some embodiments, the new trigger condition (or the seventh time threshold) may be determined by the source MN 210. In some examples, the source MN 210 may generate or decide the new trigger condition (or the seventh time threshold) by itself.

[00125] In some other embodiments, the new trigger condition (or the seventh time threshold) may be determined by the candidate target MN 215. In some examples, the source MN 210 may inform candidate target MN 215 about one or more prepared candidate (target) PCells and parameters of the associated CHO execution condition(s) for the one or more candidate (target) PCells, for example, TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the candidate target MN 215 may generate or decide the new trigger condition (or the seventh time threshold) based on the one or more prepared candidate (target) PCells and parameters of the associated CHO execution condition(s) for the one or more candidate (target) PCells. In some examples, the candidate target MN 215 may transmit the new trigger condition (or the seventh time threshold) to the source MN 210, and then the source MN 210 may transmit (e.g., via an RRC reconfiguration message) the new trigger condition (or the seventh time threshold) to the UE 230.

[00126] It is to be understood that some further example embodiments may be applied, for example, the new trigger condition may be pre-defined, pre-configured, or pre-stored at the UE 230. In some examples, the UE 230 may obtain the new trigger condition (or the seventh time threshold) which is stored at the UE 230. In some examples, the second configuration may be omitted, and the time threshold may be pre-stored at the UE 230.

[00127] In the process 400, it is assumed that the UE 230 determines that the new trigger condition is fulfilled. In addition, the UE 230 logs or stores, at 430, the first information, where the first information is associated with a successful CHO with candidate SCGs procedure.

[00128] In some example embodiments, the CHO with candidate SCGs procedure may be successfully performed, for example, the UE 230 may successfully access to the target PCell

and target PSCell. In some examples, if the new trigger condition is fulfilled, for example, the time duration between two fulfilled execution conditions equals to or exceeds the time threshold Tth, the UE 230 may log or store the first information.

[00129] In some example embodiments, no new trigger condition (or the seventh time threshold) is transmitted or configured to the UE 230, or no new trigger condition is pre-defined, pre-configured, or pre-stored at the UE 230, the UE 230 may log or store the first information, e.g. when the one or more CHO execution conditions for CHO with candidate SCG(s) and the one or more CPAC execution conditions for CHO with candidate SCG(s) are fulfilled or when CHO with candidate SCGs procedure is successfully performed, then, the UE 230 may report the first information, e.g. when the CHO with candidate SCGs procedure is successfully performed, for example, the UE 230 may report the first information to the target MN or the target SN.

[00130] In some example embodiments, the UE 230 may generate and/or store both an SHR and an SPR. In some examples, an existing UE variable (e.g. VarSuccessHO-Report) may be reused to log/store some of the first information related with successful CHO execution. In some examples, an existing UE variable (e.g. VarSuccessPSCellChange-Report) may be reused to log/store some of the first information related with successful CPAC execution.

[00131] In some example embodiments, the UE 230 may generate a new report for the near failure successful CHO with candidate SCGs procedure. In some other examples, a new UE variable (e.g., VarSuccessHOwithPSCellChange-Report) may be used to log/store the first information related with the successful CHO with candidate SCGs procedure.

[00132] In some other implementations, the trigger condition may be similar as one or more existing trigger conditions. In some implementations, T304, T310, T312 may be configured as the trigger condition for a successful report for CHO with candidate SCGs procedure. One or more time related thresholds associated with T304, T310, T312 may be defined, and each of the one or more time related thresholds may be a percentage value.

[00133] In some example embodiments, the trigger condition may include T304 trigger condition for a candidate target PCell which is associated with a first time threshold. In some examples, T304 trigger condition associated with candidate target PCell can be used for triggering a report of a CHO with candidate SCGs (e.g., the SHR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T304 trigger threshold (or the first time threshold) can

be generated/decided by the candidate target MN 215. For example, the candidate target MN 215 may determine the first time threshold, and transmit the first time threshold to the source MN 210. For example, the source MN 210 may configure the first time threshold to the UE 230. In some examples, a same first time threshold may be configured for different candidate target PCells. In some examples, the candidate target MN 215 may configure different first time thresholds for different candidate target PCells.

[00134] In some example embodiments, the trigger condition may include T310 trigger condition for a source PCell which is associated with a second time threshold. In some examples, T310 trigger condition associated with source PCell may be used for triggering a report of a CHO with candidate SCGs (e.g., the SHR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T310 trigger threshold (or the second time threshold) can be generated/decided by the source MN 210. For example, the source MN 210 may determine the second time threshold, and configure the second time threshold to the UE 230. In some examples, a same second time threshold may be configured for different candidate target PCells. In some examples, the source MN 210 may configure different second time thresholds for different candidate target PCells.

[00135] In some example embodiments, the trigger condition may include T312 trigger condition for a measurement identity of the candidate target PCell which is associated with a third time threshold. In some examples, T312 trigger condition associated with measurement identity of the candidate target PCell may be used for triggering a report of a CHO with candidate SCGs (e.g., the SHR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T312 trigger threshold (or the third time threshold) can be generated/decided by the source MN 210. For example, the source MN 210 may determine the third time threshold, and configure the third time threshold to the UE 230. In some examples, a same third time threshold may be configured for different candidate target PCells. In some examples, the source MN 210 may configure different third time thresholds for different candidate target PCells.

[00136] In some example embodiments, the trigger condition may include T304 trigger condition for a candidate target PSCell which is associated with a fourth time threshold. In some examples, T304 trigger condition associated with candidate target PSCell may be used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report,

such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T304 trigger threshold (or the fourth time threshold) can be generated/decided by the candidate target SN 225. For example, the candidate target SN 225 may determine the fourth time threshold, and transmit the fourth time threshold to the candidate target MN 215, e.g., the fourth time threshold is included in the SN Addition Request Acknowledge message or the SgNB Addition Request Acknowledge message from the candidate target SN 225 to the candidate target MN 215. For example, the candidate target MN 215 may forward the fourth time threshold to the source MN 210, e.g., the fourth time threshold is included in the Handover Request Acknowledge from the candidate target MN 215 to the source MN 210. For example, the source MN 210 may configure the fourth time threshold to the UE 230.

[00137] In some example embodiments, the trigger condition may include T310 trigger condition for a source PSCell which is associated with a fifth time threshold. In some examples, T310 trigger condition associated with source PSCell may be used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T310 trigger threshold (or the fifth time threshold) can be generated/decided by any one of: source MN 210, source SN 220, or candidate target MN 215.

[00138] In some example embodiments, the trigger condition may include T312 trigger condition for a source PSCell which is associated with a sixth time threshold. In some examples, T312 trigger condition associated with source PSCell may be used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information), the T312 trigger threshold (or the sixth time threshold) can be generated/decided by any one of: source MN 210, source SN 220, or candidate target MN 215.

[00139] In some embodiments, the source MN 210 may generate or decide the fifth/sixth time threshold associate with T310/T312 trigger condition for source PSCell which may be used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information).

[00140] In some examples, the source MN 210 may be informed to generate/decide the fifth/sixth time threshold. For example, the candidate target MN 215 may transmit an indication to the source MN 210 to explicitly instruct the source MN 210 to generate/decide the fifth/sixth time threshold, e.g., the indication may be included in a handover request acknowledge message from the candidate target MN 215 to the source MN 210. For another example, the candidate target MN 215 may implicitly instruct the source MN 210 to generate/decide the fifth/sixth time threshold, e.g., the handover request acknowledge message from the candidate target MN 215 to the source MN 210 may include parameters of one or more execution conditions for candidate target PSCell(s) (e.g. such as TTT or threshold(s) for CondEvent B1/A4), which implicitly indicate to the source MN 210 to generate/decide the fifth/sixth time threshold for T310/T312 trigger condition associated with source PSCell used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information).

[00141] In some examples, the source MN 210 may generate or decide the fifth/sixth time threshold by itself. For example, the source MN 210 may generate or decide the fifth/sixth time threshold without needing any input from another entity (such as the source SN 220).

[00142] In some examples, the source MN 210 may generate or decide the fifth/sixth time threshold based on an input from the source SN 220, where the input may include at least one configured T310/T312 timer value. For example, the source MN 210 may inform the source SN 220 to provide the at least one configured T310/T312 timer value, e.g., via SN release request, SgNB release request, Xn-U Address indication, or a new introduced message; and the source SN 220 may accordingly transmit the at least one configured T310/T312 timer value to the source MN 210. For another example, the source MN 210 can always be informed of the at least one configured T310/T312 timer value by subscription mechanism, e.g. an indication for subscription for latest configured T310/T312 timer value is included in the SN addition request message or SgNB addition request message, then, the source SN 220 shall transmit the at least one configured T310/T312 timer value configured by the source SN 220 to source MN 210 upon the T310/T312 timer value changes.

[00143] In some other embodiments, the source SN 220 may generate or decide the fifth/sixth time threshold for T310/T312 trigger condition associated with source PSCell used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used

to transfer the first information).

[00144] In some examples, the source SN 220 may generate/decide the fifth/sixth time threshold by itself or autonomously, and the source SN 220 may transmit the fifth/sixth time threshold to the source MN 210, e.g., via the SN Release Request Ack message or the SgNB Release Request Ack message.

[00145] In some examples, the source MN 210 may transmit an indication to the source SN 220, where the indication may indicate to the source SN 220 to generate/decide the fifth/sixth time threshold. For example, the indication from the source MN 210 to the source SN 220 may be included in one of: SN release request, SgNB release request, Xn-U address indication, or a new introduced message. Accordingly, the source SN 220 may generate/decide the fifth/sixth time threshold based on the indication from the source MN 210, and the source SN 220 may transmit the fifth/sixth time threshold to the source MN 210, e.g., via the SN Release Request Ack message or SgNB Release Request Ack message. For another example, the source MN 210 can always be informed of the at least one configured T310/T312 timer value by subscription mechanism, e.g. an indication for subscription for latest configured T310/T312 timer value is included in the SN addition request message or SgNB addition request message, then, the source SN 220 shall transmit the at least one configured T310/T312 timer value configured by the source SN 220 to source MN 210 upon the T310/T312 timer value changes.

[00146] In some examples, the source SN 220 may be indicated or be configured to provide a latest fifth/sixth time threshold to the source MN 210. For example, an indication for subscription of the latest fifth/sixth time threshold may be included in the SN addition request message to the source SN 220. For example, the source SN 220 may transmit the latest fifth/sixth time threshold to the source MN 210, e.g., upon an update of the fifth/sixth time threshold. For example, the source MN 210 may always be informed the latest fifth/sixth time threshold for T310/T312 trigger condition associated with source PSCell used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information).

[00147] In some other embodiments, the candidate target MN 215 may generate or decide the fifth/sixth time threshold for T310/T312 trigger condition associated with source PSCell used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined

report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information).

[00148] In some examples, the candidate target MN 215 may generate or decide the fifth/sixth time threshold by itself, and the candidate target MN 215 may transmit the fifth/sixth time threshold to the source MN 210, e.g., via the handover request acknowledge message. For example, the candidate target MN 215 may generate or decide the fifth/sixth time threshold without needing any input from another entity (such as the source SN 220).

[00149] In some examples, the candidate target MN 215 may generate or decide the fifth/sixth time threshold based on an input from the source SN 220, where the input may include at least one configured T310/T312 timer value; and the candidate target MN 215 may transmit the fifth/sixth time threshold to the source MN 210, e.g., via the handover request acknowledge message. For example, the source SN 220 or the candidate target SN 225 may transmit the at least one configured T310/T312 timer value to the candidate target MN 215. For example, the source SN 220 or the candidate target SN 225 may transmit the at least one configured T310/T312 timer value to the source MN 210, and the source MN 210 may forward the at least one configured T310/T312 timer value to the candidate target MN 215.

[00150] In some examples, the candidate target MN 215 may be indicated or be configured to provide a latest fifth/sixth time threshold to the source MN 210. For example, an indication for subscription of the latest fifth/sixth time threshold may be included in the handover request message to the candidate target MN 215. For example, the candidate target MN 215 may transmit the latest fifth/sixth time threshold to the source MN 210, e.g., upon an update of the fifth/sixth time threshold. For example, the source MN 210 may always be informed the latest fifth/sixth time threshold for T310/T312 trigger condition associated with source PSCell used for triggering a report of a CHO with candidate SCGs (e.g., the SPR or a new defined report, such as a successful HO with PSCell change report or a report with other name that is used to transfer the first information).

[00151] It can be understood that the solutions of configuring T304, T310, or T312 as the trigger condition for a successful report for CHO with candidate SCGs procedure mentioned above can also be used as solutions of configuring T304, T310, or T312 as trigger condition for an SHR for a legacy handover procedure or a CHO procedure, or, can also be used as solutions of configuring T304, T310, or T312 as trigger condition for an SPR for a legacy PSCell addition or change procedure or a CPA/CPC procedure. For example, the solutions

of configuring T304 trigger condition associated with candidate target PSCell, or T310 trigger condition associated with a source PSCell, or T312 trigger condition associated with source PSCell, as the trigger condition for a successful report for CHO with candidate SCGs procedure mentioned above, can also be used as solutions of configuring trigger condition for an SPR for a legacy PSCell addition or change procedure or for a CPA/CPC procedure.

[00152] In some example embodiments, the UE 230 may determine (log or store) the first information. In some examples, some of the first information may be related with successful CHO execution, which may be included in the SHR; and some of the first information may be related with successful CPAC execution, which may be included in the SPR. In some examples, the first information may be included in a newly defined report, such as a successful handover with PSCell change report or a report with other name that is used to include the first information. In some other examples, the first information may be included in another report, the present disclosure does not limit this aspect.

[00153] In some embodiments, a trigger condition for triggering SHR or successful handover with PSCell change report may be fulfilled, and a trigger condition for triggering SPR or successful handover with PSCell change report may be fulfilled.

[00154] In some examples, the trigger condition for triggering SHR or successful handover with PSCell change report may be fulfilled may include: a ratio between a value of the elapsed time of the elapsed timer T304 for a (candidate) target PCell and a configured value of the timer T304 (i.e. which may be included in the last applied RRCReconfiguration message for CHO with candidate SCGs procedure) is greater than the first time threshold. In some examples, the trigger condition for triggering SHR or successful handover with PSCell change report may be fulfilled may include: a ratio between a value of the elapsed time of the timer T310 for a source PCell and a configured value of the timer T310 configured for the source PCell (while the UE 230 was connected to the source PCell before executing the last HO execution or CHO with candidate SCGs procedure) is greater than the second time threshold. In some examples, the trigger condition for triggering SHR or successful handover with PSCell change report may be fulfilled may include: T312 associated to the measurement identity of a (candidate) target PCell has been running at the time of initiating the last HO execution or CHO with candidate SCGs procedure, and a ratio between a value of the elapsed time of the timer T312 and the configured value of the timer T312 is greater than the third time threshold.

[00155] In some examples, the trigger condition for triggering SPR or successful handover with PSCell change report may be fulfilled may include: a ratio between a value of the elapsed time of the elapsed timer T304 for a (candidate) target PSCell and a configured value of the timer T304 (i.e. which may be included in the last applied RRCReconfiguration message for CHO with candidate SCGs procedure) is greater than the fourth time threshold. In some examples, the trigger condition for triggering SPR or successful handover with PSCell change report may be fulfilled may include: a ratio between a value of the elapsed time of the timer T310 for a source PSCell and a configured value of the timer T310 configured for the source PSCell (while the UE 230 was connected to the source PCell before executing the last CPAC execution or CHO with candidate SCGs procedure) is greater than the fifth time threshold. In some examples, the trigger condition for triggering SPR or successful handover with PSCell change report may be fulfilled may include: a ratio between a value of the elapsed time of the timer T312 for the source PSCell and the configured value of the timer T312 configured for the source PSCell (while the UE 230 was connected to the source PSCell before executing the last CPAC execution or CHO with candidate SCGs procedure) is greater than the sixth time threshold.

[00156] In some implementations, the first information may be included in SHR and SPR or successful handover with PSCell change report or a report with other name that is used to include the first information. In some example embodiments, the UE 230 may generate the SHR and the SPR. In some example embodiments, the UE may generate the successful handover with PSCell change report or a report with other name that is used to include the first information. In some implementations, the first information may be included in a RRC message (e.g. RRC (connection) reconfiguration complete message that is transmitted by the UE to the target MN).

[00157] In some examples, the first information may include a new cause value of the successful report. For example, the new cause value may indicate that the first information associated with a successful CHO with candidate SCGs is stored due a fulfillment of the at least one trigger condition which is associated with at least one time threshold. For example, the new cause value may indicate that the time duration between two fulfilled execution conditions for CHO with candidate SCG(s) exceeds the time threshold Tth.

[00158] In some examples, the first information may include a type of the first fulfilled execution condition for CHO with candidate SCGs. For example, the type may indicate that the first fulfilled execution condition is a CHO execution condition for CHO with

candidate SCGs. For example, the type may indicate that the first fulfilled execution condition is a CPAC execution condition for CHO with candidate SCGs.

[00159] In some examples, the first information may include the time duration between two fulfilled execution conditions for CHO with candidate SCGs. For example, a time duration may be a time length from a time when a CHO execution condition for CHO with candidate SCGs is fulfilled and a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled, that is, a time elapsed since the CHO execution condition for CHO with candidate SCGs is fulfilled until the CPAC execution condition for CHO with candidate SCGs is fulfilled. For example, a time duration may be a time length from a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled and a time when a CHO execution condition for CHO with candidate SCGs is fulfilled, that is, a time elapsed since the CPAC execution condition for CHO with candidate SCGs is fulfilled until the CHO execution condition for CHO with candidate SCGs is fulfilled.

[00160] In some examples, the first information may include a new type for lastHO-Type or a new type for lastPSCellchange-Type, e.g., chowithcandidateSCGs. For example, the type may indicate that the first information is for a CHO with candidate SCGs.

[00161] In some examples, the first information may include latest received CHO execution condition(s) for CHO with candidate SCGs, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the first information may include latest received CPAC execution condition(s) for CHO with candidate SCGs, e.g. TTT or threshold(s) for CondEvent B1/A4.

[00162] In some examples, the first information may include latest radio measurement results of at least one neighbor cell. For example, the at least one neighbor cell may include at least one neighbor PCell and/or at least one neighbor PSCell.

[00163] In some examples, the first information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs or not, e.g. the first information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs. In some examples, the first information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs or not, e.g. the first information may include an indication concerning that a measured neighbor cell included in

the measurement results is a candidate target PSCell for CHO with candidate SCGs.

[00164] In some examples, the first information may include a list of candidate target PCell(s) latest configured for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results. In some examples, the first information may include a list of the candidate target PSCell(s) latest configured for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PSCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00165] In addition or alternatively, the UE 230 may further transmit the first information to a receiving node, e.g., to the target MN 215, the target SN 225, or a further RAN node that is a serving RAN node of the UE 230 (such as a base station which is not shown in FIG. 2).

[00166] In some example embodiments, the SHR and the SPR may be reused for a successful CHO with candidate SCGs procedure, to store or report the first information. In some embodiments, the UE 230 may transmit the SHR and the SPR to a receiving node (the target MN 215, the target SN, or a further RAN node that is a serving RAN node of the UE 230).

[00167] In some examples, the UE 230 may transmit an indication to the receiving node (the target MN 215, the target SN, or a further RAN node that is a serving RAN node of the UE 230) notifying that both the SHR and the SPR for CHO with candidate SCGs procedure are available. For example, the indication concerning availability of both SHR and SPR that is sent to to the receiving node may be included in an RRC message, such as an RRC (connection) reconfiguration complete message.

[00168] In some examples, the UE 230 may transmit a first indication to the receiving node notifying that the SHR for CHO with candidate SCGs procedure is available, and transmit a second indication to the receiving node notifying that the SPR for CHO with candidate SCGs procedure is available. For example, the UE 230 may send an indication concerning availability of SHR for CHO with candidate SCGs procedure to the receiving node in one RRC message (e.g. RRC reconfiguration complete message), also the UE may send another indication concerning availability of SPR for CHO with candidate SCGs procedure to the receiving node in the same RRC message.

[00169] In some examples, both the SHR and SPR can be requested from the UE by the receiving node via only one request message, after the UE receives the request message, both

the SHR and SPR can be responded to the receiving node by the UE via only one RRC message. For example, the receiving node may transmit a request for the SHR and the SPR to the UE 230, e.g. the request may be a UE information request message, which may be an RRC message. In some examples, the UE 230 may transmit the SHR and the SPR to the receiving node based on the request from the receiving node, for example, the SHR and the SPR and included in a same message, e.g., a UE information response message, which may be an RRC message.

[00170] In some other example embodiments, a new report (such as successful handover with PSCell change report or a report with other name that is used to include the first information) may be used for a successful CHO with candidate SCGs procedure, to store or report the first information.

[00171] In some examples, the UE 230 may transmit an indication to the receiving node (the target MN 215, the target SN, or a further RAN node that is a serving RAN node of the UE 230) notifying that the first information related with a near failure successful CHO with candidate SCGs is available or the successful handover with PSCell change report for CHO with candidate SCGs procedure is available. That is, the UE 230 may transmit an indication concerning an availability of the first information or an availability of the successful handover with PSCell change report or an availability of storing information related with a near failure successful CHO with candidate SCGs procedure to the receiving node. For example, the indication to the receiving node may be included in an RRC message, such as an RRC (connection) reconfiguration complete message.

[00172] In some examples, the receiving node may transmit an indication (or a request) for the first information or the successful handover with PSCell change report to the UE 230, for example, the receiving node may send a RRC message (e.g. UE information request message) to the UE to request for the first information or the successful handover with PSCell change report, wherein an indication of requesting for the first information or the successful handover with PSCell change report may be included in the RRC message. In some examples, the UE 230 may transmit the first information or the successful handover with PSCell change report (which includes the first information) to the receiving node based on the indication (or request) from the receiving node, e.g., the first information or the successful handover with PSCell change report may be transmitted via a UE information response message, which may be an RRC message.

[00173] On the other side of communication, the receiving node (the target MN 215, the target SN, or a further RAN node that is a serving RAN node of the UE 230) may receive the SHR and the SPR, or receive the successful handover with PSCell change report or a report with other name that is used to include the first information from the UE 230. In some example embodiments, the receiving node may forward the SHR and the SPR or the successful handover with PSCell change report or a report with other name that is used to include the first information to the source MN 210. In some example embodiments, if the receiving node is not the target MN 215, the receiving node may forward the SHR and the SPR or the successful handover with PSCell change report or a report with other name that is used to include the first information to the target MN 215.

[00174] In some implementations, the source MN 210 may further perform an MRO analysis, based on the first information, or SHR and the SPR, or the successful handover with PSCell change report, or a report with other name that is used to include the first information.

[00175] In some example embodiments, the SHR and the SPR may be transmitted to the source MN 210, and the source MN 210 should identify the first information included in the SHR and SPR for proper MRO analysis and optimization. In some embodiments, the source MN 210 need to identify that the SHR and the SPR are for a same UE in a same CHO with candidate SCGs procedure. In some examples, the receiving node may transmit an indication concerning the SHR and SPR are for a same UE in a same CHO with candidate SCGs procedure to the source MN 210 (e.g. based on indication from the UE concerning that both SHR and SPR are available for a CHO with candidate SCGs, or based on the same new cause value in both SHR and SPR). The receiving node may forward both SHR and SPR to the source MN 210 simultaneously via a same X2/Xn message, which implicitly indicates to the source MN 210 that the SHR and SPR are for a same UE in a same CHO with candidate SCGs procedure. In some examples, a common IE for identification may be included in both SHR and SPR, e.g., the common IE may be source PCell C-RNTI, source PSCell C-RNTI, target PCell C-RNTI, or target PSCell C-RNTI; or the common IE may be an indication concerning the SHR and SPR are for a same UE in a same CHO with candidate SCGs procedure.

[00176] In some examples, the source MN 210 may analyze whether parameters of CHO execution conditions for candidate target PCells need to be optimized. In some examples, the source MN 210 may analyze whether parameters of CPAC execution conditions for candidate target PSCells need to be optimized. In some example embodiments, the source

MN 210 may generate (or determine) an analysis result. In some examples, the source MN 210 may transmit the analysis result to the target MN 215. For example, the analysis result may indicate that parameters of CPAC execution conditions for candidate target PSCells need to be optimized. For example, the analysis result may indicate that parameters of CHO execution conditions for candidate target PCells need to be optimized. In some examples, the target MN 215 may further optimize the parameters of CPAC execution conditions for candidate target PSCells accordingly.

[00177] In some implementations, the source MN 210 may transmit the first information, or SHR and the SPR, or the successful handover with PSCell change report, or a report with other name that is used to include the first information to the target MN 215. In some examples, the target MN 215 may further perform an MRO analysis, based on the first information or SHR and the SPR, or the successful handover with PSCell change report, or a report with other name that is used to include the first information. In some examples, the target MN 215 may analysis whether parameters of CHO execution conditions for candidate target PCells need to be optimized. In some examples, the target MN 215 may analysis whether parameters of CPAC execution conditions for candidate target PSCells need to be optimized. In some example embodiments, the target MN 215 may generate (or determine) an analysis result. In some examples, the target MN 215 may transmit the analysis result to the source MN 210. For example, the analysis result may indicate that parameters of CHO execution conditions for candidate target PCells need to be optimized. For example, the analysis result may indicate that parameters of CPAC execution conditions for candidate target PSCells need to be optimized. In some examples, the source MN 210 may further optimize the parameters of CHO execution conditions for candidate target PSCells accordingly.

[00178] In addition or alternatively, the UE 230 may transmit capability information of the UE 230 to network, e.g., the UE 230 may transmit the capability information of the UE 230 to the source MN 210 or the source SN 220. For example, the capability information may be transmitted to the source MN 210, which may further transmit (e.g., forward) the capability information to the source SN 220 or candidate target MN 215 or candidate target SN 225. In some examples, the capability information may indicate that the UE 230 supports the CHO with candidate SCGs procedure. In some examples, the capability information may indicate that the UE has a capability of storing or reporting a report (or the first information) associated with a successful CHO with candidate SCGs.

[00179] For example, an optional UE capability with signalling for storing or reporting the report (or the first information) associated with a successful CHO with candidate SCGs may be introduced. For example, storing or reporting the report or the first information or successful CHO with candidate SCGs procedure related information is optional even if UE supports CHO with candidate SCGs mechanism, and this capability is explicitly signalled by the UE to network, i.e. introduce an optional UE capability with signalling for storing or reporting the report or the first information or successful CHO with candidate SCGs procedure related information, e.g. include an optional UE capability indication for storing or reporting the report or the first information or successful CHO with candidate SCGs procedure related information, e.g. in a UE Capability Information message.

[00180] It is to be understood that the capability information may be omitted in some cases, for example, the UE 230 may not explicit transmit its capability of supporting the CHO with candidate SCGs procedure, or of storing or reporting a report (or the first information) associated with a successful CHO with candidate SCGs. For example, an optional UE capability without signalling for storing or reporting the successful report (or the first information) associated with a successful CHO with candidate SCGs may be introduced, storing or reporting the successful report (or the first information) associated with a successful CHO with candidate SCGs is optional, no explicit capability bit is signalled by the UE.

[00181] According to some example embodiments with reference to FIG. 4, a second configuration including at least one time threshold may be provided to the UE 230, and the UE 230 may store first information in case a trigger condition associated with the at least one time threshold is fulfilled. In some examples, the trigger condition is fulfilled may indicate that a near failure successful CHO with candidate SCGs occurs, in some examples, the source MN and the target MN may further perform the MRO for better configuration in the future.

[00182] It is to be understood that the process 400 relates to a successful (near failure successful) CHO with candidate SCGs procedure. In some other implementations, the CHO with candidate SCGs procedure may be failed or a failure may happen in the CHO with candidate SCGs procedure, for example, the UE 230 fails to handover or access to the target PCell, or a RLF occurs shortly after the UE 230 successfully handover or access to the target PCell, or the UE 230 fails to perform PSCell addition or PSCell change or access to the target PSCell, or, a SCG failure or a RLF occurs shortly after the UE 230 successfully performs PSCell addition or PSCell change or access to the target PSCell. When the CHO with

candidate SCGs procedure fails or a failure happens in the CHO with candidate SCGs procedure, a failure report may be generated by the UE 230 and the failure report may be further transmitted to a further RAN node that is a serving RAN node of the UE 230. In some example embodiments, the failure report may include one or more of: a type of the first fulfilled execution condition for the CHO with candidate SCGs if any (for example, the type may indicate that the first fulfilled execution condition is a CHO execution condition for CHO with candidate SCGs, or the type may indicate that the first fulfilled execution condition is a CPAC execution condition for CHO with candidate SCGs), time duration between two fulfilled execution conditions for CHO with candidate SCGs if any (for example, a time duration may be a time length from a time when a CHO execution condition for CHO with candidate SCGs is fulfilled and a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled, that is, a time elapsed since the CHO execution condition for CHO with candidate SCGs is fulfilled until the CPAC execution condition for CHO with candidate SCGs is fulfilled. Or, a time duration may be a time length from a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled and a time when a CHO execution condition for CHO with candidate SCGs is fulfilled, that is, a time elapsed since the CPAC execution condition for CHO with candidate SCGs is fulfilled until the CHO execution condition for CHO with candidate SCGs is fulfilled), a new type for lastHO-Type or a new type for lastPSCellchange-Type, e.g., chowithcandidateSCGs (for example, the type may indicate that the failure happens in a CHO with candidate SCGs procedure), latest received one or more CHO execution conditions for the CHO with candidate SCGs, latest received one or more CAPC execution conditions for the CHO with candidate SCGs, latest radio measurement results of at least one neighbor cell, an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs (e.g. an indication indicating the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs), an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs (e.g. an indication indicating the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs), a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell (e.g., one cell within the list of candidate PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), or a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell (e.g., one cell within the list of candidate PSCell(s) can be represented by PLMN+CGI, or PCI+ARFCN). In

some example embodiments, the failure report may be a RLF report. In some example embodiments, the failure report may be transmitted to a further RAN node that is a serving RAN node of the UE 230 by the UE 230. In some example embodiments, the failure report may be transferred to the source MN 210 (e.g. from the further RAN node), and/or the failure report may be transferred to the target MN 215 (e.g. from the further RAN node), the source MN 210 or the target MN 215 may perform MRO analysis or optimization, for example, source MN 210 or the target MN 215 may analyze whether parameters of CPAC execution conditions for CHO with candidate SCGs and/or whether parameters of CHO execution conditions for CHO with candidate SCGs need to be optimized, then, source MN 210 or the target MN 215 may perform corresponding optimization based on analysis.

[00183] Reference is further made to FIG. 5, which illustrates a signalling chart illustrating communication process 500 in accordance with some example embodiments of the present disclosure. The process 500 may involve a source MN 210, a UE 230, and a target MN 215.

[00184] In the process 500, the source MN 210 transmits, at 510, a first configuration to the UE 230, e.g. the first configuration can be called as configurations for CHO with candidate SCG(s) as mentioned above. The first configuration may include one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs.

[00185] In some example embodiments, for each candidate target PCell, the source MN 210 may configure a corresponding CHO execution condition for CHO with candidate SCG(s), which may consist of one or two trigger conditions, such as CondEvent A3/A4/A5. In some example embodiments, for each candidate target PSCell, a corresponding candidate target MN may provide parameters of a CPAC execution condition to the source MN 210, and the source MN 210 then generate and transmit the one or more CPAC execution conditions for CHO with candidate SCG(s) to the UE 230 in the first configuration.

[00186] In some examples, the first configuration may indicate a first candidate target PCell and an associated first candidate target PSCell, where the first candidate target PCell may be associated with a first CHO execution condition and the first candidate target PSCell may be associated with a first CPAC execution condition. In some examples, the first configuration may indicate a second candidate target PCell and an associated second candidate target PSCell, where the second candidate target PCell may be associated with a second CHO execution condition and the second candidate target PSCell may be associated with a second

CPAC execution condition. It is to be understood that the number of candidate target PCells indicated by the first configuration is not limited in the present disclosure, and the number of candidate target PSCells indicated by the first configuration is not limited in the present disclosure.

[00187] In the process 500, the source MN 210 transmits, at 520, a third configuration to the UE 230. The third configuration may include at least one CHO execution condition for CHO-only, e.g. the third configuration can be called as configurations for CHO-only as mentioned above. For example, the third configuration or the configurations for CHO-only include at least one MCG configuration for at least one candidate target PCell (wherein the candidate target PCell for CHO-only may be same or different with the candidate target PCell for CHO with candidate SCG(s)), and at least one CHO execution condition for at least one candidate target PCell for CHO-only. In some example embodiments, the third configuration may indicate that: at least one candidate target PCell for CHO-only is configured, and, for each candidate target PCell within the at least one candidate target PCell for CHO-only, a corresponding CHO execution condition for CHO-only is configured.

[00188] In the process 500, the source MN 210 transmits, at 530, a fourth configuration to the UE 230. The fourth configuration may include at least one CHO execution condition for legacy R17 CHO with SCG, e.g. the fourth configuration can be called as configurations for CHO with SCG as mentioned above. For example, the fourth configuration or the configurations for CHO with SCG include at least one MCG configuration for at least one candidate target PCell (wherein the candidate target PCell for CHO with SCG may be same or different with the candidate target PCell for CHO with candidate SCG(s)), at least one CHO execution condition for at least one candidate target PCell for CHO with SCG, and at least one SCG configuration for at least one target PSCell (wherein for each candidate target PCell for CHO with SCG, one associated target PSCell is configured). In some example embodiments, the fourth configuration may indicate that: at least one candidate target PCell for CHO with SCG is configured, and, for each candidate target PCell within the at least one candidate target PCell for CHO with SCG, a corresponding CHO execution condition for CHO with SCG is configured.

[00189] It is to be understood that one of the operations 520 and 530 may be omitted in some cases. For example, there may be the first configuration and the third configuration which are configured to the UE 230 without the fourth configuration. For another example, there may be the first configuration and the fourth configuration which are configured to the UE

230 without the third configuration.

[00190] It is to be understood that the operation 520 and 530 may be executed in some cases. For example, the first configuration, the third configuration and the fourth configuration may be configured to the UE 230, e.g. in a same one RRC message, or in two RRC messages, or in three RRC messages.

[00191] In some example embodiments, the UE 230 may evaluate the one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs. In some example embodiments, the UE 230 may also evaluate the at least one CHO execution condition for CHO-only. In some example embodiments, the UE 230 may also evaluate the at least one CHO execution condition for CHO with SCG.

[00192] In some embodiments, a CHO execution condition for CHO with candidate SCGs may be fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is not fulfilled, or a CPAC execution condition for CHO with candidate SCGs is fulfilled but the associated CHO execution condition for CHO with candidate SCGs is not fulfilled, in addition, a CHO execution condition for CHO-only is fulfilled, in this case, a CHO-only execution may be performed. For example, the UE 230 may perform the CHO-only execution to a first target PCell which fulfills the CHO execution condition for CHO-only.

[00193] In some other embodiments, a CHO execution condition for CHO with candidate SCGs may be fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is not fulfilled, or a CPAC execution condition for CHO with candidate SCGs is fulfilled but the associated CHO execution condition for CHO with candidate SCGs is not fulfilled, in addition, a CHO execution condition for legacy R17 CHO with SCG is fulfilled, in this case, the legacy R17 CHO with SCG execution may be performed. For example, the UE 230 may perform an execution of legacy R17 CHO with SCG, e.g. the UE access to a second target PCell and its associated target PSCell, where the second target PCell fulfills the CHO execution condition for CHO with SCG, e.g. the UE handover or access to the second target PCell, also the UE performs PSCell addition or PSCell change or access to the target PSCell associated with the second target PCell.

[00194] In the process 500, the UE 230 performs, at 540, an access towards the first target PCell, or the second target PCell and its associated target PSCell.

[00195] In the process 500, the UE 230 stores, at 550, second information. The second

information may be associated with a successful CHO-only or a successful legacy R17 CHO with SCG, while the CHO with candidate SCGs can't be executed, or a failure happens even the CHO with candidate SCGs is executed.

[00196] In some example embodiments, the second information may include some information related with CHO with candidate SCGs, and some information related with CHO-only or legacy CHO with SCG. In some example embodiments, the UE receives one or more trigger condition for storing or reporting the second information or the information related with a successful CHO-only or a successful legacy CHO with SCG, when at least one of the one or more trigger conditions for storing or reporting the second information or the information related with a successful CHO-only or a successful legacy CHO with SCG is fulfilled, the UE may store or report the second information or the information related with a successful CHO-only or a successful legacy CHO with SCG. In some example, even the UE does not receive one or more trigger conditions for storing or reporting the second information or the information related with a successful CHO-only or a successful legacy CHO with SCG, when CHO-only or legacy CHO with SCG is successful, the UE may store or report the second information or the information related with a successful CHO-only or a successful legacy CHO with SCG.

[00197] In some implementations, the second information may include a type of the first fulfilled execution condition for CHO with candidate SCGs, if any. For example, the type may indicate that the first fulfilled execution condition is a CHO execution condition for CHO with candidate SCGs. For example, the type may indicate that the first fulfilled execution condition is a CPAC execution condition for CHO with candidate SCGs. For example, the type may be absent, which indicates that neither a CPAC execution condition for CHO with candidate SCGs is fulfilled nor a CHO execution condition for CHO with candidate SCGs is fulfilled.

[00198] In some examples, the second information may include a new type for lastHO-Type or a new type for lastPSCellchange-Type, e.g., cho-only, or chowithSCG. For example, the type may indicate that the second information is for CHO-only or legacy R17 CHO with SCG.

[00199] In some examples, the second information may include latest received CHO execution condition(s) for CHO with candidate SCGs, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the second information may include latest received CPAC execution condition(s) for CHO with candidate SCGs, e.g. TTT or

threshold(s) for CondEvent B1/A4.

[00200] In some examples, the second information may include latest received CHO execution condition(s) for CHO-only, if any, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the second information may include latest received CHO execution condition(s) for legacy CHO with SCG, if any, e.g. TTT or threshold(s) for CondEvent A3/A4/A5.

[00201] In some examples, the second information may include latest radio measurement results of at least one neighbor cell. For example, the at least one neighbor cell may include at least one neighbor PCell and/or at least one neighbor PSCell.

[00202] In some examples, the second information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs or not, e.g. the second information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs. In some examples, the second information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs or not e.g. the second information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs.

[00203] In some examples, the second information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO-only or not, e.g. the second information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO-only. In some examples, the second information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG or not, e.g. the second information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG.

[00204] In some examples, the second information may include a list of candidate target PCell(s) latest configured for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00205] In some examples, the second information may include a list of candidate target

PSCell(s) latest configured for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PSCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00206] In some examples, the second information may include a list of candidate target PCell(s) latest configured for CHO-only, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00207] In some examples, the second information may include a list of candidate target PCell(s) latest configured for legacy CHO with SCG, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00208] In some examples, in case the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CHO execution condition for the CHO with candidate SCGs, then the second information may further include one of more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time length between a first time and a second time, a time length between a third time and the second time, or a time length between the third time and the first time. For example, an ID of a candidate PCell which fulfills its associated CHO execution condition for CHO with candidate SCGs may be included. For example, an ID of an associated candidate PSCell which does not fulfil its associated CPAC execution condition for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled. For example, the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received. For example, the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled.

[00209] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CHO execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is fulfilled but CPAC execution condition

for CHO with candidate SCGs is not fulfilled), the second information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PCell, and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell, whose CHO execution condition for CHO with candidate SCGs is fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is not fulfilled;
- reuse the existing IE e.g. TimeSinceCHO-Reconfig for CHO-only or legacy CHO with SCG, e.g. to indicate the time elapsed between the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs);
- add a new IE to indicate time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs); or
- add a new IE to indicate time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG, or time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the CHO-only execution or an execution for legacy CHO with SCG is performed.

[00210] With reference to FIG. 6A, which illustrates an example timing schematic diagram 610. It is assumed that t0 represents a time of a reception of a latest conditional configuration, that is a last one of: a time for reception of the first configuration, a time for reception of the third configuration, and a time for reception of the fourth configuration. It is assumed that t1 represents a time when a CHO execution condition for CHO with candidate SCGs is fulfilled. It is assumed that t2 represents a time when a CHO execution condition

for CHO-only or for legacy CHO with SCG is fulfilled. As shown in FIG. 6A, T1 may represent a time length between t0 and t1, T2 may represent a time length between t1 and t2, and T3 may represent a time length between t0 and t2.

[00211] For example, second information may include one or more of T1, T2, or T3. For example, an IE TimeSinceCHO-Reconfig may be reused to indicate T3. For example, a new IE may be used to indicate T1. For example, another new IE may be used to indicate T2.

[00212] In some examples, in case the of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CPAC execution condition for the CHO with candidate SCGs, then the second information may further include one or more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time length between a first time and a second time, a time length between a fourth time and the second time, or a time length between the fourth time and the first time. For example, an ID of a candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs is included. For example, an ID of a candidate PSCell (which is associated with the candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs) which fulfills its associated CPAC execution conditions for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled. For example, the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received. For example, the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled.

[00213] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CPAC execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is not fulfilled but CPAC execution condition for CHO with candidate SCGs is fulfilled), the second information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target

PCell, and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell, whose CHO execution condition for CHO with candidate SCGs is not fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is fulfilled;

- reuse the existing IE TimeSinceCHO-Reconfig for CHO-only or legacy CHO with SCG, e.g., to indicate the time elapsed between the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs);
- add a new IE to indicate time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs); or
- add a new IE to indicate time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG, or time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the CHO-only execution or an execution for legacy CHO with SCG is performed.

[00214] With reference to FIG. 6B, which illustrates an example timing schematic diagram 620. It is assumed that t0 represents a time of a reception of a latest conditional configuration, that is a last one of: a time for reception of the first configuration, a time for reception of the third configuration, and a time for reception of the fourth configuration. It is assumed that t11 represents a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled. It is assumed that t2 represents a time when a CHO execution condition for CHO-only or for legacy CHO with SCG is fulfilled. As shown in FIG. 6B, T11 may represent a time length between t0 and t11, T12 may represent a time length between t11 and t2, and T3 may represent a time length between t0 and t2.

[00215] For example, second information may include one or more of T11, T12, or T3. For

example, an IE TimeSinceCHO-Reconfig may be reused to indicate T3. For example, a new IE may be used to indicate T11. For example, another new IE may be used to indicate T12.

[00216] In addition or alternatively, the UE 230 may further transmit the second information to a receiving node, e.g., to the target MN 215, the target SN 225, or a further RAN node that is a serving RAN node of the UE 230 (such as a base station which is not shown in FIG. 2).

[00217] In some example embodiments, the SHR or the SPR may be reused for a transmission of the second information, or the SHR or the SPR may be reused to store or report the second information. In some embodiments, the UE 230 may transmit the SHR to a receiving node (the target MN 215, the target SN 225, or a further RAN node), where the SHR include the second information. In some examples, the SHR may be triggered or stored or reported by the UE 230 to the receiving node.

[00218] In some examples, the SHR may be forwarded from the receiving node to the target MN 215. In some examples, the target MN 215 may perform an MRO based on the SHR. In some examples, the target MN 215 may analyses whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized. In some examples, the target MN 215 may indicate the analysis outcome about whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized to the source MN 210 (e.g., the target MN 215 may inform the source MN 210 that parameters of CPAC execution conditions for CHO with candidate SCGs need to be optimized).

[00219] In some examples, the SHR may be forwarded from the receiving node to the source MN 210. In some examples, the source MN 210 may perform an MRO based on the SHR. In some examples, the source MN 210 may analyses whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized. In some examples, the source MN 210 may indicate the analysis outcome about whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized to the target MN 215 (e.g., the source MN 210 may inform the target MN 215 that parameters of CPAC execution conditions for CHO with candidate SCGs need to be optimized). In some examples, the source MN 210 may analyses whether parameters of CHO execution conditions for CHO-only or whether parameters of CHO execution conditions for legacy CHO with SCG or whether parameters of CHO execution conditions for CHO with candidate SCGs needs to be optimized. In some examples, the source MN 210 may indicate the

analysis outcome about whether parameters of CHO execution conditions for CHO-only or whether parameters of CHO execution conditions for legacy CHO with SCG or whether parameters of CHO execution conditions for CHO with candidate SCGs needs to be optimized to the target MN 215 (e.g., the source MN 210 may inform the target MN 215 that parameters of CHO execution conditions for CHO with candidate SCGs need to be optimized).

[00220] In some other example embodiments, if SHR is not triggered/stored/reported in the UE 230, the UE 230 may report the second information to a receiving node, e.g., in an RRC reconfiguration complete message. In some examples, the receiving node may be the target MN 215.

[00221] In some examples, the target MN 215 may analyses whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized. In some examples, the target MN 215 may indicate the analysis outcome about whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized to the source MN 210 (e.g., the target MN 215 may inform the source MN 210 that parameters of CPAC execution conditions for CHO with candidate SCGs need to be optimized).

[00222] In some examples, the target MN 215 may analyses whether parameters of CHO execution conditions for CHO-only or for legacy CHO with SCG or for CHO with candidate SCGs needs to be optimized. In some examples, the target MN 215 may indicate the analysis outcome about whether parameters of CHO execution conditions for CHO-only or for legacy CHO with SCG or for CHO with candidate SCGs needs to be optimized to the source MN 210 (e.g., the target MN 215 may inform the source MN 210 that parameters of CHO execution conditions for CHO with candidate SCGs need to be optimized).

[00223] In some examples, the second information may be forwarded by the target MN 215 to the source MN 210. In some examples, the source MN 210 may analysis whether parameters of CHO execution conditions for CHO-only or for legacy CHO with SCG or for CHO with candidate SCGs needs to be optimized. In some examples, the source MN 210 may analysis whether parameters of CPAC execution conditions for CHO with candidate SCGs needs to be optimized.

[00224] As mentioned above, when CHO with candidate SCG(s) can't be triggered but a CHO execution condition for CHO-only is met, an execution of CHO-only may be performed by the UE, e.g., access to a first target PCell which fulfills the CHO execution condition for

CHO-only. However, in some examples, a failure happens in CHO-only, i.e. the execution of CHO-only may be failed, or an RLF occurs shortly after a successful execution of CHO-only. For example, a synchronization with the first target PCell or a random access to the first target PCell is failed. For example, the UE 230 fails to handover or access to the first target PCell, or a RLF occurs shortly after the UE 230 successfully handover or access to the first target PCell.

[00225] Similarly, as mentioned above, when CHO with candidate SCG(s) can't be triggered but a CHO execution condition for legacy CHO with SCG is met, an execution of legacy CHO with SCG may be performed by the UE, e.g., access to a second target PCell and its associated target PSCell, where the second target PCell fulfills the CHO execution condition for legacy CHO with SCG. However, in some examples, a failure happens in legacy CHO with SCG, i.e. the execution of legacy CHO with SCG may be failed, or an RLF occurs shortly after a successful execution of legacy CHO with SCG. For example, a synchronization with the second target PCell or a random access to the second target PCell is failed. For example, the UE 230 fails to handover or access to the second target PCell, or a RLF occurs shortly after the UE 230 successfully handover or access to the second target PCell.

[00226] In some implementations, the UE 230 may store (or log) first failure information. For example, the first failure information may be associated with a failure happens in CHO-only, or with a failure happens in legacy CHO with SCG, e.g. the first failure information may be associated with a failure when accessing to the first target PCell or the second target PCell. In some implementations, the first failure information may be further transmitted to a further RAN node that is a serving RAN node of the UE 230. In some implementations, the first failure information may be included in a RLF report. In some example embodiments, the first failure information may be transferred to the source MN 210, and/or the failure report may be transferred to the target MN 215, the source MN 210 or the target MN 215 may perform MRO analysis or optimization, for example, source MN 210 or the target MN 215 may analyze whether parameters of CPAC execution conditions for CHO with candidate SCGs and/or whether parameters of CHO execution conditions for CHO with candidate SCGs need to be optimized, then, source MN 210 or the target MN 215 may perform corresponding optimization based on analysis.

[00227] In some implementations, the first failure information may include some information related with CHO with candidate SCGs, and some information related with

CHO-only or legacy CHO with SCG.

[00228] In some examples, the first failure information may include an ID of a source PCell (i.e., a source PCell ID), (e.g., the ID can be represented by PLMN+CGI, or PCI+ARFCN). For example, the source PCell may be provided by the source MN 210.

[00229] In some examples, the first failure information may include an ID of a target PCell (i.e., a target PCell ID), (e.g., the ID can be represented by PLMN+CGI, or PCI+ARFCN). For example, the target PCell may be the first target PCell or the second target PCell discussed above.

[00230] In some examples, the first failure information may include a type of the first fulfilled execution condition for CHO with candidate SCGs, if any. For example, the type may indicate that the first fulfilled execution condition is a CHO execution condition for CHO with candidate SCGs. For example, the type may indicate that the first fulfilled execution condition is a CPAC execution condition for CHO with candidate SCGs. For example, the type may be absent, which indicates that neither a CPAC execution condition for CHO with candidate SCGs is fulfilled nor a CHO execution condition for CHO with candidate SCGs is fulfilled.

[00231] In some examples, in case the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CHO execution condition for the CHO with candidate SCGs, then the first failure information may further include one of more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time length between a first time and a second time, a time length between a third time and the second time, a time length between the third time and the first time, a time length between the first time and a fifth time, a time length between the second time and the fifth time, or a time length between the third time and the fifth time. For example, an ID of a candidate PCell which fulfills its associated CHO execution condition for CHO with candidate SCGs may be included. For example, an ID of an associated candidate PSCell which does not fulfil its associated CPAC execution conditions for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO

with SCG is fulfilled. For example, the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received. For example, the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled. For example, the fifth time is a time when the CHO-only execution is failed or when the execution of CHO with SCG is failed or when an RLF occurs shortly after a successful CHO-only execution or when an RLF occurs shortly after a successful execution of CHO with SCG.

[00232] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CHO execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is fulfilled but CPAC execution condition for CHO with candidate SCGs is not fulfilled), the first failure information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PCell, and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell whose CHO execution condition for CHO with candidate SCGs is fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is not fulfilled;
- reuse the existing IE e.g. TimeSinceCHO-Reconfig for CHO-only or legacy CHO with SCG, e.g. to indicate the time elapsed between the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, CHO with candidate SCGs and CHO with candidate SCGs);
- reuse the existing IE e.g. timeConnFailure for CHO-only or legacy CHO with SCG, e.g. reuse timeConnFailure to indicate the time elapsed since the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) until connection failure (i.e. a failure happens in CHO-only, or a failure happens in legacy CHO with SCG);

- add a new IE to indicate time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs);
- or, add a new IE to indicate time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG, or time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the CHO-only execution or an execution for legacy CHO with SCG is performed; or
- add a new IE to indicate time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and connection failure (i.e. a failure happens in CHO-only, or a failure happens in legacy CHO with SCG).

[00233] In some examples, in case the of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CPAC execution condition for the CHO with candidate SCGs, then the first failure information may further include one or more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time length between a first time and a second time, a time length between a fourth time and the second time, a time length between the fourth time and the first time, a time length between the first time and a fifth time, a time length between the second time and the fifth time, or a time length between the fourth time and the fifth time. For example, an ID of a candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs is included. For example, an ID of a candidate PSCell (which is associated with a candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs) which fulfills its associated CPAC execution conditions for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled. For example, the second time is a time when one

of the first configuration, the third configuration, or the fourth configuration is received. For example, the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled. For example, the fifth time is a time when the CHO-only execution is failed or when the execution of CHO with SCG is failed or when an RLF occurs shortly after a successful CHO-only execution or when an RLF occurs shortly after a successful execution of CHO with SCG.

[00234] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CPAC execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is not fulfilled but CPAC execution condition for CHO with candidate SCGs is fulfilled), the first failure information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PCell and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell whose CHO execution condition for CHO with candidate SCGs is not fulfilled but CPAC execution condition for CHO with candidate SCGs is fulfilled;
- reuse the existing IE TimeSinceCHO-Reconfig for CHO-only or legacy CHO with SCG, e.g. to indicate the time elapsed between the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) and the reception of the latest conditional reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs);
- reuse the existing IE e.g. timeConnFailure for CHO-only or legacy CHO with SCG, e.g. reuse timeConnFailure to indicate the time elapsed since the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG (or between CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or, between the CHO-only execution or an execution for legacy CHO with SCG is performed) until connection failure (i.e. a failure happens in CHO-only, or a failure happens in legacy CHO with SCG);
- add a new IE to indicate time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional

reconfiguration (for CHO-only and CHO with candidate SCGs, or for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs);

- add a new IE to indicate time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the initiation of the last CHO execution towards the target PCell for CHO-only or legacy CHO with SCG, or time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and CHO execution condition for CHO-only or legacy CHO with SCG is fulfilled, or time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the CHO-only execution or an execution for legacy CHO with SCG is performed; or
- add a new IE to indicate time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and connection failure (i.e. a failure happens in CHO-only, or a failure happens in legacy CHO with SCG).

[00235] In some examples, the first failure information may include latest received CHO execution condition(s) for CHO with candidate SCGs, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the first failure information may include latest received CPAC execution condition(s) for CHO with candidate SCGs, e.g. TTT or threshold(s) for CondEvent B1/A4.

[00236] In some examples, the first failure information may include latest received CHO execution condition(s) for CHO-only, if any, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the first failure information may include latest received CHO execution condition(s) for legacy CHO with SCG, if any, e.g. TTT or threshold(s) for CondEvent A3/A4/A5.

[00237] In some examples, the first failure information may include latest radio measurement results of at least one neighbor cell. For example, the at least one neighbor cell may include at least one neighbor PCell and/or at least one neighbor PSCell.

[00238] In some examples, the first failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs or not, e.g. the first failure information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs. In some examples, the first failure information may include an indication about whether a measured neighbor cell included in

the measurement results is a candidate target PSCell for CHO with candidate SCGs or not, e.g. the first failure information may include an indication concerning a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs.

[00239] In some examples, the first failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO-only or not, e.g. the first failure information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO-only. In some examples, the first failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG or not, e.g. the first failure information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG.

[00240] In some examples, the first failure information may include a list of the latest configured candidate target PCell(s) for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00241] In some examples, the first failure information may include a list of the latest configured candidate target PSCell(s) for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PSCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00242] In some examples, the first failure information may include a list of the latest configured candidate target PCell(s) for CHO-only, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00243] In some examples, the first failure information may include a list of the latest configured candidate target PCell(s) for legacy CHO with SCG, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00244] In some examples, the first failure information may include a failure type or an indication indicating that the CHO-only execution or the execution of CHO with SCG is failed. For example, the first failure information may include an indication concerning that

CHO-only or legacy CHO with SCG fails in case that both CHO-only and CHO with candidate SCGs are configured or both legacy CHO with SCG and CHO with candidate SCGs are configured or CHO-only, legacy CHO with SCG and CHO with candidate SCGs are configured (especially when neither CHO execution condition for CHO with candidate SCGs nor CPAC execution condition for CHO with candidate SCGs is fulfilled). For example, a new type for lastHO-Type may be introduced, and included in the first failure information, e.g., cho-onlyinchowithcandidateSCGs or chowithSCGinchowithcandidateSCGs. For example, a new one-bit flag may be used as the indication.

[00245] In addition or alternatively, the UE 230 may further transmit the first failure information to a receiving node, e.g., a further RAN node which serves the UE 230(such as a base station which is not shown in FIG. 2). In some examples, the first failure information may be included in an RLF report.

[00246] Similarly, as mentioned above, when CHO with candidate SCG(s) can't be triggered but a CHO execution condition for legacy CHO with SCG is met, an execution of legacy CHO with SCG may be performed, e.g., access to a second target PCell and its associated target PSCell, where the second target PCell fulfills the CHO execution condition for legacy CHO with SCG. However, in some examples, a failure happens in legacy CHO with SCG, i.e. the PSCell addition or change to the target PSCell may fail, or a SCG failure may occur shortly after a successful execution of legacy CHO with SCG (e.g., after successful PSCell addition or change).

[00247] In some implementations, the UE 230 may store (or log) second failure information. For example, the second failure information may be associated with a failure happens in legacy CHO with SCG, e.g. the second failure information may be associated with a failure when accessing to the target PSCell which is associated with the second target PCell. In some implementations, the second failure information may be further transmitted to the target MN or a further RAN node that is a serving RAN node of the UE 230. In some implementations, the second failure information may be included in a RLF report or a SCG failure information message. In some example embodiments, the second failure information may be transferred to the source MN 210, and/or the failure report may be transferred to the source SN, and/or the failure report may be transferred to the target SN, the source MN or the source SN or the target MN or the target SN may perform MRO analysis or optimization, for example, source MN 210 or the source SN or the target MN or the target

SN may analyze whether parameters of CPAC execution conditions for CHO with candidate SCGs and/or whether parameters of CHO execution conditions for CHO with candidate SCGs need to be optimized, then, source MN or the source SN or the target MN or the target SN may perform corresponding optimization based on analysis.

[00248] In some implementations, the second failure information may include some information related with CHO with candidate SCGs, and some information related with legacy CHO with SCG.

[00249] In some examples, the second failure information may include an ID of a source PSCell (i.e., a source PSCell ID), (e.g., the ID can be represented by PLMN+CGI, or PCI+ARFCN). For example, the source PSCell may be provided by the source SN 220.

[00250] In some examples, the second failure information may include an ID of a target PSCell (i.e., a target PSCell ID), (e.g., the ID can be represented by PLMN+CGI, or PCI+ARFCN). For example, the target PSCell may be the target PSCell associated with the second target PCell discussed above.

[00251] In some examples, the second failure information may include a type of the first fulfilled execution condition for CHO with candidate SCGs, if any. For example, the type may indicate that the first fulfilled execution condition is a CHO execution condition for CHO with candidate SCGs. For example, the type may indicate that the first fulfilled execution condition is a CPAC execution condition for CHO with candidate SCGs. For example, the type may be absent, which indicates that neither a CPAC execution condition for CHO with candidate SCGs is fulfilled nor a CHO execution condition for CHO with candidate SCGs is fulfilled.

[00252] In some examples, in case the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CHO execution condition for the CHO with candidate SCGs, then the second failure information may further include one of more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time length between a first time and a second time, a time length between a third time and the second time, a time length between the third time and the first time, a time length between the first time and a sixth time, a time length between the second time and the sixth time, or a

time length between the third time and the sixth time. For example, an ID of a candidate PCell which fulfills its associated CHO execution conditions for CHO with candidate SCGs may be included. For example, an ID of an associated candidate PSCell which does not fulfil its associated CPAC execution conditions for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled. For example, the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received. For example, the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled. For example, the sixth time is a time when SCG failure happens, i.e. when the access to the target PSCell associated with the second target PCell is failed or when a SCG failure occurs shortly after a successful access to the target PSCell (e.g. a successful PSCell addition or change to the target PSCell).

[00253] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CHO execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is fulfilled but CPAC execution condition for CHO with candidate SCGs is not fulfilled), the second failure information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PCell, and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell whose CHO execution condition for CHO with candidate SCGs is fulfilled but the associated CPAC execution condition for CHO with candidate SCGs is not fulfilled;
- time elapsed between the reception of the latest conditional reconfiguration (for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs) and the SCG failure, e.g. reuse the existing IE e.g. timeSCGFailure to indicate the time info;
- time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional reconfiguration (for legacy CHO with SCG and CHO with candidate SCGs or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs);
- time elapsed between the CHO execution condition for CHO with candidate SCGs is

fulfilled and the CHO execution condition for CHO with SCG is fulfilled;

- time elapsed between the CHO execution condition for CHO with SCG is fulfilled and the SCG failure;
- time elapsed between the CHO execution condition for CHO with SCG is fulfilled and the reception of the latest conditional reconfiguration (for legacy CHO with SCG and CHO with candidate SCGs or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs); or
- time elapsed between the CHO execution condition for CHO with candidate SCGs is fulfilled and the SCG failure.

[00254] With reference to FIG. 6C, which illustrates an example timing schematic diagram 630. It is assumed that t0 represents a time of a reception of a latest conditional configuration, that is a last one of: a time for reception of the first configuration, and a time for reception of the fourth configuration. It is assumed that t1 represents a time when a CHO execution condition for CHO with candidate SCGs is fulfilled. It is assumed that t2 represents a time when a CHO execution condition for legacy CHO with SCG is fulfilled. It is assumed that t3 represents a time when SCG failure happens in the legacy CHO with SCG, i.e. when the access to the target PSCell associated with the second target PCell is failed or when a SCG failure occurs shortly after a successful access to the target PSCell (e.g. a successful PSCell addition or change to the target PSCell).

[00255] As shown in FIG. 6C, Ta may represent a time length between t0 and t1, Tb may represent a time length between t1 and t2, and Tc may represent a time length between t2 and t3. For example, second failure information may include one or more of Ta, Tb, Tc, Ta+Tb, Tb+Tc, or Ta+Tb+Tc. For example, an IE TimeSinceSCGFailure may be reused to indicate Ta+Tb+Tc. For example, a new IE may be used to indicate each of: Ta, Tb, Tc, Ta+Tb, or Tb+Tc.

[00256] In some examples, in case the of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, in other word, if the first fulfilled execution condition for the CHO with candidate SCGs is a CPAC execution condition for the CHO with candidate SCGs, then the second failure information may further include one or more of: an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, a time

length between a first time and a second time, a time length between a fourth time and the second time, a time length between the fourth time and the first time, a time length between the first time and a sixth time, a time length between the second time and the sixth time, or a time length between the fourth time and the sixth time. For example, an ID of a candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs is included. For example, an ID of a candidate PSCell (which is associated with a candidate PCell which does not fulfil its associated CHO execution conditions for CHO with candidate SCGs) which fulfills its associated CPAC execution conditions for CHO with candidate SCGs may be included. For example, the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled. For example, the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received. For example, the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled. For example, the sixth time is a time when SCG failure happens, i.e. when the access to the target PSCell associated with the second target PCell is failed or when a SCG failure occurs shortly after a successful access to the target PSCell (e.g. a successful PSCell addition or change to the target PSCell).

[00257] As an example, if the type of the first fulfilled execution condition for CHO with candidate SCGs is CPAC execution condition for CHO with candidate SCGs (i.e., CHO execution condition for CHO with candidate SCGs is not fulfilled but CPAC execution condition for CHO with candidate SCGs is fulfilled), the second failure information may include at least one of:

- ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PCell and/or ID (e.g. PLMN+CGI, or PCI+ARFCN) or related CondReconfigId of candidate target PSCell whose CHO execution condition for CHO with candidate SCGs is not fulfilled but CPAC execution condition for CHO with candidate SCGs is fulfilled;
- time elapsed between the reception of the latest conditional reconfiguration (for legacy CHO with SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs) and the SCG failure, e.g. reuse the existing IE e.g. timeSCGFailure to indicate the time info;
- time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the reception of the latest conditional reconfiguration (for legacy CHO with

SCG and CHO with candidate SCGs, or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs);

- time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the CHO execution condition for CHO with SCG is fulfilled;
- time elapsed between the CHO execution condition for CHO with SCG is fulfilled and the SCG failure;
- time elapsed between the CHO execution condition for CHO with SCG is fulfilled and the reception of the latest conditional reconfiguration (for legacy CHO with SCG and CHO with candidate SCGs or, for CHO-only, legacy CHO with SCG and CHO with candidate SCGs); or
- time elapsed between the CPAC execution condition for CHO with candidate SCGs is fulfilled and the SCG failure.

[00258] With reference to FIG. 6D, which illustrates an example timing schematic diagram 640. It is assumed that t0 represents a time of a reception of a latest conditional configuration, that is a last one of: a time for reception of the first configuration, and a time for reception of the fourth configuration. It is assumed that t11 represents a time when a CPAC execution condition for CHO with candidate SCGs is fulfilled. It is assumed that t2 represents a time when a CHO execution condition for legacy CHO with SCG is fulfilled. It is assumed that t3 represents a time when SCG failure happens in the legacy CHO with SCG, i.e. when the access to the target PSCell associated with the second target PCell is failed or when a SCG failure occurs shortly after a successful access to the target PSCell (e.g. a successful PSCell addition or change to the target PSCell).

[00259] As shown in FIG. 6D, Ta1 may represent a time length between t0 and t11, Tb1 may represent a time length between t11 and t2, and Tc may represent a time length between t2 and t3. For example, second failure information may include one or more of Ta1, Tb1, Tc, Ta1+Tb1, Tb1+Tc, or Ta1+Tb1+Tc. For example, an IE TimeSinceSCGFailure may be reused to indicate Ta1+Tb1+Tc. For example, a new IE may be used to indicate each of: Ta1, Tb1, Tc, Ta1+Tb1, or Tb1+Tc.

[00260] In some examples, the second failure information may include latest received CHO execution condition(s) for CHO with candidate SCGs, e.g., TTT or threshold(s) for CondEvent A3/A4/A5. In some examples, the second failure information may include latest received CPAC execution condition(s) for CHO with candidate SCGs, e.g. TTT or

threshold(s) for CondEvent B1/A4.

[00261] In some examples, the second failure information may include latest received CHO execution condition(s) for legacy CHO with SCG, if any, e.g. TTT or threshold(s) for CondEvent A3/A4/A5.

[00262] In some examples, the second failure information may include latest radio measurement results of at least one neighbor cell. For example, the at least one neighbor cell may include at least one neighbor PCell and/or at least one neighbor PSCell.

[00263] In some examples, the second failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs or not, e.g. the second failure information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PCell for CHO with candidate SCGs. In some examples, the second failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs or not, e.g. the second failure information may include an indication concerning that a measured neighbor cell included in the measurement results is a candidate target PSCell for CHO with candidate SCGs.

[00264] In some examples, the second failure information may include an indication about whether a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG or not, e.g. the second failure information may include an indication concerning a measured neighbor cell included in the measurement results is a candidate target PCell for legacy CHO with SCG.

[00265] In some examples, the second failure information may include a list of the latest configured candidate target PCell(s) for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00266] In some examples, the second failure information may include a list of the latest configured candidate target PSCell(s) for CHO with candidate SCGs, (e.g., one cell within the list of candidate target PSCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00267] In some examples, the second failure information may include a list of the latest configured candidate target PCell(s) for legacy CHO with SCG, (e.g., one cell within the list

of candidate target PCell(s) can be represented by PLMN+CGI, or PCI+ARFCN), for example, which are not included in the measurement results.

[00268] In some examples, the second failure information may include a failure type or an indication indicating that the execution of CHO with SCG is failed or SCG failure happens in CHO with SCG. For example, the second failure information may include an indication concerning that legacy CHO with SCG fails or SCG failure happens in CHO with SCG, in case that both legacy CHO with SCG and CHO with candidate SCGs are configured or CHO-only, legacy CHO with SCG and CHO with candidate SCGs are configured (especially when neither CHO execution condition for CHO with candidate SCGs nor CPAC execution condition for CHO with candidate SCGs is fulfilled). For example, a new type may be introduced, and included in the second failure information, e.g., synchReconfigFailureinchowithSCGandchowithcandidateSCGs. For example, a new one-bit flag may be used as the indication.

[00269] In addition or alternatively, the UE 230 may further transmit the second failure information to a receiving node, e.g., the target MN 215 or a further RAN node which serves the UE 230 (such as a base station which is not shown in FIG. 2). In some examples, the second failure information may be included in a RLF report or the SCG failure information message.

[00270] In some implementations, a further MRO may be performed, e.g., by the target MN 215 or by the source MN 210, which may refer to those discussed above, which will not be repeated herein for brevity.

[00271] According to some example embodiments with reference to FIG. 5, in case the CHO with candidate SCGs is not triggered, a CHO-only execution or legacy CHO with SCG execution may be performed.

[00272] It is to be understood that some example embodiments described above are only for illustration without any limitation, for example, some information above may be combined, some information may be omitted, some information may be modified, the present disclosure does not limit this aspect.

[00273] FIG. 7 illustrates an example of a device 700 that is suitable for implementing embodiments of the present disclosure. The device 700 may be an example of a source MN 210, a source SN 220, a target MN 215, a target SN, or a UE 230 as described herein. The device 700 may support wireless communication with the source MN 210, the source SN 220,

the target MN 215, the target SN, the UE 230, or any combination thereof. The device 700 may include components for bi-directional communications including components for transmitting and receiving communications, such as a processor 702, a memory 704, a transceiver 706, and, optionally, an I/O controller 708. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[00274] The processor 702, the memory 704, the transceiver 706, or various combinations thereof or various components thereof may be examples of means for performing various aspects of the present disclosure as described herein. For example, the processor 702, the memory 704, the transceiver 706, or various combinations or components thereof may support a method for performing one or more of the operations described herein.

[00275] In some implementations, the processor 702, the memory 704, the transceiver 706, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include a processor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA) or other programmable logic device, a discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting a means for performing the functions described in the present disclosure. In some implementations, the processor 702 and the memory 704 coupled with the processor 702 may be configured to perform one or more of the functions described herein (e.g., executing, by the processor 702, instructions stored in the memory 704).

[00276] For example, the processor 702 may support wireless communication at the device 700 in accordance with examples as disclosed herein. The processor 702 may be configured to operable to support a means for receiving, from a first RAN node, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; means for receiving, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure; and means for in accordance with a determination that at least one trigger condition associated with the at least one time threshold is fulfilled, storing or reporting the first information associated with the successful CHO with candidate SCGs procedure. The processor 702 may be configured to operable to support a means for transmitting, to a UE, a first configuration

comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs; and means for transmitting, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure. The processor 702 may be configured to operable to support a means for receiving, from a UE or a second RAN node, first information or second information, the UE being configured with one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs, the second RAN node being a target SN or a further RAN node; and means for performing an MRO analysis based on the first information or the second information. The processor 702 may be configured to operable to support a means for determining time related information comprising one of: at least one latest configured timer value for T310 or T312, or a fifth time threshold associated with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell; and means for transmitting, to a source MN, the time related information.

[00277] The processor 702 may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some implementations, the processor 702 may be configured to operate a memory array using a memory controller. In some other implementations, a memory controller may be integrated into the processor 702. The processor 702 may be configured to execute computer-readable instructions stored in a memory (e.g., the memory 704) to cause the device 700 to perform various functions of the present disclosure.

[00278] The memory 704 may include random access memory (RAM) and read-only memory (ROM). The memory 704 may store computer-readable, computer-executable code including instructions that, when executed by the processor 702 cause the device 700 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some implementations, the code may not be directly executable by the processor 702 but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some implementations, the memory 704 may include, among other things, a basic I/O system

(BIOS) which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[00279] The I/O controller 708 may manage input and output signals for the device 700. The I/O controller 708 may also manage peripherals not integrated into the device M02. In some implementations, the I/O controller 708 may represent a physical connection or port to an external peripheral. In some implementations, the I/O controller 708 may utilize an operating system such as iOS®, ANDROID®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. In some implementations, the I/O controller 708 may be implemented as part of a processor, such as the processor 706. In some implementations, a user may interact with the device 700 via the I/O controller 708 or via hardware components controlled by the I/O controller 708.

[00280] In some implementations, the device 700 may include a single antenna 710. However, in some other implementations, the device 700 may have more than one antenna 710 (i.e., multiple antennas), including multiple antenna panels or antenna arrays, which may be capable of concurrently transmitting or receiving multiple wireless transmissions. The transceiver 706 may communicate bi-directionally, via the one or more antennas 710, wired, or wireless links as described herein. For example, the transceiver 706 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 706 may also include a modem to modulate the packets, to provide the modulated packets to one or more antennas 710 for transmission, and to demodulate packets received from the one or more antennas 710. The transceiver 706 may include one or more transmit chains, one or more receive chains, or a combination thereof.

[00281] A transmit chain may be configured to generate and transmit signals (e.g., control information, data, packets). The transmit chain may include at least one modulator for modulating data onto a carrier signal, preparing the signal for transmission over a wireless medium. The at least one modulator may be configured to support one or more techniques such as amplitude modulation (AM), frequency modulation (FM), or digital modulation schemes like phase-shift keying (PSK) or quadrature amplitude modulation (QAM). The transmit chain may also include at least one power amplifier configured to amplify the modulated signal to an appropriate power level suitable for transmission over the wireless medium. The transmit chain may also include one or more antennas 710 for transmitting the amplified signal into the air or wireless medium.

[00282] A receive chain may be configured to receive signals (e.g., control information, data, packets) over a wireless medium. For example, the receive chain may include one or more antennas 710 for receive the signal over the air or wireless medium. The receive chain may include at least one amplifier (e.g., a low-noise amplifier (LNA)) configured to amplify the received signal. The receive chain may include at least one demodulator configured to demodulate the receive signal and obtain the transmitted data by reversing the modulation technique applied during transmission of the signal. The receive chain may include at least one decoder for decoding the processing the demodulated signal to receive the transmitted data.

[00283] FIG. 8 illustrates an example of a processor 800 that is suitable for implementing some embodiments of the present disclosure. The processor 800 may be an example of a processor configured to perform various operations in accordance with examples as described herein. The processor 800 may include a controller 802 configured to perform various operations in accordance with examples as described herein. The processor 800 may optionally include at least one memory 804, such as L1/L2/L3 cache. Additionally, or alternatively, the processor 800 may optionally include one or more arithmetic-logic units (ALUs) 800. One or more of these components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more interfaces (e.g., buses).

[00284] The processor 800 may be a processor chipset and include a protocol stack (e.g., a software stack) executed by the processor chipset to perform various operations (e.g., receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) in accordance with examples as described herein. The processor chipset may include one or more cores, one or more caches (e.g., memory local to or included in the processor chipset (e.g., the processor 800) or other memory (e.g., random access memory (RAM), read-only memory (ROM), dynamic RAM (DRAM), synchronous dynamic RAM (SDRAM), static RAM (SRAM), ferroelectric RAM (FeRAM), magnetic RAM (MRAM), resistive RAM (RRAM), flash memory, phase change memory (PCM), and others).

[00285] The controller 802 may be configured to manage and coordinate various operations (e.g., signaling, receiving, obtaining, retrieving, transmitting, outputting, forwarding, storing, determining, identifying, accessing, writing, reading) of the processor 800 to cause the processor 800 to support various operations in accordance with examples as described herein.

For example, the controller 802 may operate as a control unit of the processor 800, generating control signals that manage the operation of various components of the processor 800. These control signals include enabling or disabling functional units, selecting data paths, initiating memory access, and coordinating timing of operations.

[00286] The controller 802 may be configured to fetch (e.g., obtain, retrieve, receive) instructions from the memory 804 and determine subsequent instruction(s) to be executed to cause the processor 800 to support various operations in accordance with examples as described herein. The controller 802 may be configured to track memory address of instructions associated with the memory 804. The controller 802 may be configured to decode instructions to determine the operation to be performed and the operands involved. For example, the controller 802 may be configured to interpret the instruction and determine control signals to be output to other components of the processor 800 to cause the processor 800 to support various operations in accordance with examples as described herein. Additionally, or alternatively, the controller 802 may be configured to manage flow of data within the processor 800. The controller 802 may be configured to control transfer of data between registers, arithmetic logic units (ALUs), and other functional units of the processor 800.

[00287] The memory 804 may include one or more caches (e.g., memory local to or included in the processor 800 or other memory, such RAM, ROM, DRAM, SDRAM, SRAM, MRAM, flash memory, etc. In some implementations, the memory 804 may reside within or on a processor chipset (e.g., local to the processor 800). In some other implementations, the memory 804 may reside external to the processor chipset (e.g., remote to the processor 800).

[00288] The memory 804 may store computer-readable, computer-executable code including instructions that, when executed by the processor 800, cause the processor 800 to perform various functions described herein. The code may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. The controller 802 and/or the processor 800 may be configured to execute computer-readable instructions stored in the memory 804 to cause the processor 800 to perform various functions. For example, the processor 800 and/or the controller 802 may be coupled with or to the memory 804, the processor 800, the controller 802, and the memory 804 may be configured to perform various functions described herein. In some examples, the processor 800 may include multiple processors and the memory 804 may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple memories, which may,

individually or collectively, be configured to perform various functions herein.

[00289] The one or more ALUs 800 may be configured to support various operations in accordance with examples as described herein. In some implementations, the one or more ALUs 800 may reside within or on a processor chipset (e.g., the processor 800). In some other implementations, the one or more ALUs 800 may reside external to the processor chipset (e.g., the processor 800). One or more ALUs 800 may perform one or more computations such as addition, subtraction, multiplication, and division on data. For example, one or more ALUs 800 may receive input operands and an operation code, which determines an operation to be executed. One or more ALUs 800 be configured with a variety of logical and arithmetic circuits, including adders, subtractors, shifters, and logic gates, to process and manipulate the data according to the operation. Additionally, or alternatively, the one or more ALUs 800 may support logical operations such as AND, OR, exclusive-OR (XOR), not-OR (NOR), and not-AND (NAND), enabling the one or more ALUs 800 to handle conditional operations, comparisons, and bitwise operations.

[00290] The processor 800 may support wireless communication in accordance with examples as disclosed herein. The processor 800 may be configured to or operable to support a means for operations described in some embodiments of the present disclosure.

[00291] FIG. 9 illustrates a flowchart of a method 900 performed by a UE in accordance with aspects of the present disclosure. The operations of the method 900 may be implemented by a device or its components as described herein. For example, the operations of the method 900 may be performed by a UE 230 as mentioned in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device may perform aspects of the described functions using special-purpose hardware.

[00292] At 910, the method may include receiving, from a first RAN node, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs. The operations of 910 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 910 may be performed by the UE 230 as described with reference to FIG. 2.

[00293] At 920, the method may include receiving, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being

used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure. The operations of 920 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 920 may be performed by the UE 230 as described with reference to FIG. 2.

[00294] At 930, the method may include if at least one trigger condition associated with the at least one time threshold is fulfilled, storing or reporting the first information associated with the successful CHO with candidate SCGs procedure. The operations of 930 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 930 may be performed by the UE 230 as described with reference to FIG. 2.

[00295] FIG. 10 illustrates a flowchart of a method 1000 performed by a source MN in accordance with aspects of the present disclosure. The operations of the method 1000 may be implemented by a device or its components as described herein. For example, the operations of the method 1000 may be performed by the source MN 210 as mentioned in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device may perform aspects of the described functions using special-purpose hardware.

[00296] At 1010, the method may include transmitting, to a UE, a first configuration comprising one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs. The operations of 1010 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1010 may be performed by the source MN 210 as described with reference to FIG. 2.

[00297] At 1020, the method may include transmitting, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure. The operations of 1020 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1020 may be performed by the source MN 210 as described with reference to FIG. 2.

[00298] FIG. 11 illustrates a flowchart of a method 1100 performed by a target MN in accordance with aspects of the present disclosure. The operations of the method 1100 may

be implemented by a device or its components as described herein. For example, the operations of the method 1100 may be performed by the target MN 215 in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device may perform aspects of the described functions using special-purpose hardware.

[00299] At 1110, the method may include receiving, from a UE or a second RAN node, first information or second information, the UE being configured with one or more CHO execution conditions for CHO with candidate SCGs and one or more CPAC execution conditions for CHO with candidate SCGs, the second RAN node being a target SN or a further RAN node. The operations of 1110 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1110 may be performed by the target MN 215 as described with reference to FIG. 2.

[00300] At 1120, the method may include performing an MRO analysis based on the first information or the second information. The operations of 1120 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1120 may be performed by the target MN 215 as described with reference to FIG. 2.

[00301] FIG. 12 illustrates a flowchart of a method 1200 performed by a source SN in accordance with aspects of the present disclosure. The operations of the method 1200 may be implemented by a device or its components as described herein. For example, the operations of the method 1200 may be performed by the source SN 220 in FIG. 2. In some implementations, the device may execute a set of instructions to control the function elements of the device to perform the described functions. Additionally, or alternatively, the device may perform aspects of the described functions using special-purpose hardware.

[00302] At 1210, the method may include determining time related information comprising one of: at least one latest configured timer value for T310 or T312, or a fifth time threshold associated with T310 trigger condition for a source PSCell, or a sixth time threshold associated with T312 trigger condition for a source PSCell. The operations of 1210 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1210 may be performed by the source SN 220 as described with reference to FIG. 2.

[00303] At 1220, the method may include transmitting, to a source MN, the time related

information. The operations of 1220 may be performed in accordance with examples as described herein. In some implementations, aspects of the operations of 1220 may be performed by the source SN 220 as described with reference to FIG. 2.

[00304] It should be noted that the methods described herein describes possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

[00305] The various illustrative blocks and components described in connection with the disclosure herein may be implemented or performed with a general-purpose processor, a DSP, an ASIC, a CPU, an FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but in the alternative, the processor may be any processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices (e.g., a combination of a DSP and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[00306] The functions described herein may be implemented in hardware, software executed by a processor, firmware, or any combination thereof. If implemented in software executed by a processor, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described herein may be implemented using software executed by a processor, hardware, firmware, hardwiring, or combinations of any of these. Features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations.

[00307] Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer. By way of example, non-transitory computer-readable media may include RAM, ROM, electrically erasable programmable ROM (EEPROM), flash memory, compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other

non-transitory medium that may be used to carry or store desired program code means in the form of instructions or data structures and that may be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor.

[00308] As used herein, including in the claims, an article "a" before an element is unrestricted and understood to refer to "at least one" of those elements or "one or more" of those elements. The terms "a," "at least one," "one or more," and "at least one of one or more" may be interchangeable. As used herein, including in the claims, "or" as used in a list of items (e.g., a list of items prefaced by a phrase such as "at least one of" or "one or more of" or "one or both of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on. Further, as used herein, including in the claims, a "set" may include one or more elements.

[00309] The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. A user equipment (UE) comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the UE to:

receive, from a first radio access network (RAN) node, a first configuration comprising one or more conditional handover (CHO) execution conditions for CHO with candidate secondary cell groups (SCGs) and one or more conditional primary SCG cell (PSCell) addition and change (CPAC) execution conditions for CHO with candidate SCGs;

receive, from the first RAN node, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure; and

in accordance with a determination that at least one trigger condition associated with the at least one time threshold is fulfilled, store or report the first information associated with the successful CHO with candidate SCGs procedure.

2. The UE of claim 1, wherein the at least one time threshold comprises:

a seventh time threshold associated with a time duration between a time when the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled and a time when the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled.

3. The UE of claim 2, wherein the at least one processor is further configured to cause the UE to:

in accordance with a determination that the time duration between a time when the one or more CHO execution conditions for CHO with candidate SCGs are fulfilled and a time when the one or more CPAC execution conditions for CHO with candidate SCGs are fulfilled exceeds the seventh time threshold, determine that the at least one trigger condition associated with the at least one time threshold is fulfilled.

4. The UE of claim 1, wherein the first information associated with the successful CHO with candidate SCGs procedure comprises one of:

a cause value indicating that the first information associated with the successful CHO with candidate SCGs procedure is stored due to a fulfillment of the at least one trigger condition,

a type of a first fulfilled execution condition for the CHO with candidate SCGs,

a time duration between two fulfilled execution conditions for the CHO with candidate SCGs,

a type indicating it is a CHO with candidate SCGs procedure,

latest received one or more CHO execution conditions for the CHO with candidate SCGs,

latest received one or more CAPC execution conditions for the CHO with candidate SCGs,

latest radio measurement results of at least one neighbor cell,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs,

a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell, or

a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell.

5. The UE of claim 1, wherein the at least one processor is further configured to cause the UE to:

transmit, to a second RAN node, the first information associated with the successful CHO with candidate SCGs procedure, wherein the second RAN node is one of: a target master node (MN), a target secondary node (SN), or a further RAN node.

6. The UE of claim 5, wherein the at least one processor is further configured to cause the UE to:

transmit, to the second RAN node, an indication concerning an availability of the first information; and

receive, from the second RAN node, a request for the first information.

7. The UE of claim 1, wherein the at least one processor is further configured to

cause the UE to:

receive, from the first RAN node, a third configuration comprising at least one CHO execution condition for CHO-only; and/or

receive, from the first RAN node, a fourth configuration comprising at least one CHO execution condition for CHO with SCG.

8. The UE of claim 7, wherein the at least one processor is further configured to cause the UE to:

in accordance with a determination that the one or more CHO execution conditions for CHO with candidate SCGs or the one or more CPAC execution conditions for CHO with candidate SCGs are not fulfilled, and at least one of the at least one CHO execution condition for CHO-only is fulfilled, perform a CHO-only execution towards a first target PCell satisfying the at least one of the at least one CHO execution condition for CHO-only; or

in accordance with a determination that the one or more CHO execution conditions for CHO with candidate SCGs or the one or more CPAC execution conditions for CHO with candidate SCGs are not fulfilled, and at least one of the at least one CHO execution condition for CHO with SCG is fulfilled, perform an execution of CHO with SCG towards a second target PCell satisfying the at least one of the at least one CHO execution condition for CHO with SCG and a target PSCell associated with the second target PCell.

9. The UE of claim 8, wherein the at least one processor is further configured to cause the UE to:

store second information comprising one of:

a type of a first fulfilled execution condition for the CHO with candidate SCGs,

latest received one or more CHO execution conditions for the CHO with candidate SCGs,

latest received one or more CAPC execution conditions for the CHO with candidate SCGs,

latest received at least one CHO execution condition for the CHO-only,

latest received at least one CHO execution condition for the CHO with SCG,

latest radio measurement results of at least one neighbor cell,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs,

an indication indicating whether the at least one neighbor cell belongs to at least

one candidate PCell configured for the CHO-only,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs,

a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PCells configured for the CHO-only that are not within the at least one neighbor cell, or

a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell; and

transmit the second information to a second RAN node, wherein the second RAN node is one of: a target MN, a target SN, or a further RAN node.

10. The UE of claim 9, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the second information further comprises one of:

an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a third time and the second time, or

a time length between the third time and the first time,

wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, and

wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled.

11. The UE of claim 9, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the second information further comprises one of:

an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a fourth time and the second time, or

a time length between the fourth time and the first time,

wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received, and

wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled.

12. The UE of claim 8, wherein the at least one processor is further configured to cause the UE to:

in accordance with a determination that an access to the first target PCell of the CHO-only execution or an access to the second target PCell of the execution of CHO with SCG is failed, store first failure information comprising one of:

an ID of a source PCell,

an ID of the first target PCell or the second target PCell,

a type of a first fulfilled execution condition for the CHO with candidate SCGs,

latest received one or more CHO execution conditions for the CHO with candidate SCGs,

latest received one or more CAPC execution conditions for the CHO with candidate SCGs,

latest received at least one CHO execution condition for the CHO-only,

latest received at least one CHO execution condition for the CHO with SCG,

latest radio measurement results of at least one neighbor cell,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO-only,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs,

a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PCells configured for the CHO-only that are not within the at least one neighbor cell,

a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell, or

a failure type or an indication indicating that the CHO-only execution or the execution of CHO with SCG is failed.

13. The UE of claim 12, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the first failure information further comprises one of:

an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a third time and the second time,

a time length between the third time and the first time,

a time length between the first time and a fifth time,

a time length between the second time and the fifth time, or

a time length between the third time and the fifth time,

wherein the first time is a time when the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received,

wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled, and

wherein the fifth time is a time when the CHO-only execution or the execution of CHO with SCG is failed.

14. The UE of claim 12, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the first failure information further comprises one of:

an ID indicating a candidate PCell and an ID indicating a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a fourth time and the second time,

a time length between the fourth time and the first time,

a time length between the first time and a fifth time,

a time length between the second time and the fifth time, or

a time length between the fourth time and the fifth time,

wherein the first time is a time the at least one CHO execution condition for CHO-only is fulfilled or the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when one of the first configuration, the third configuration, or the fourth configuration is received,

wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled, and

wherein the fifth time is a time when the CHO-only execution or the execution of CHO with SCG is failed.

15. The UE of claim 8, wherein the at least one processor is further configured to

cause the UE to:

in accordance with a determination that an access to the target PSCell associated with the second target PCell of the execution of CHO with SCG is failed, store second failure information comprising one of:

an ID of a source PSCell,

an ID of the target PSCell associated with the second target PCell,

a type of a first fulfilled execution condition for the CHO with candidate SCGs,

latest received one or more CHO execution conditions for the CHO with candidate SCGs,

latest received one or more CAPC execution conditions for the CHO with candidate SCGs,

latest received at least one CHO execution condition for the CHO with SCG,

latest radio measurement results of at least one neighbor cell,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with candidate SCGs,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PCell configured for the CHO with SCG,

an indication indicating whether the at least one neighbor cell belongs to at least one candidate PSCell configured for the CHO with candidate SCGs,

a list of candidate PCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PSCells configured for the CHO with candidate SCGs that are not within the at least one neighbor cell,

a list of candidate PCells configured for the CHO with SCG that are not within the at least one neighbor cell, or

a failure type or an indication indicating that the CHO-only execution or the execution of CHO with SCG is failed.

16. The UE of claim 15, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CHO execution conditions for the CHO with candidate SCGs, and the second failure information further comprises one of:

an ID indicating a candidate PCell and an ID of a candidate PSCell associated with the candidate PCell, wherein the candidate PCell fulfills one of the one or more CHO

execution conditions for CHO with candidate SCGs, and the candidate PSCell does not fulfil one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a third time and the second time,

a time length between the third time and the first time,

a time length between the first time and a sixth time,

a time length between the second time and the sixth time, or

a time length between the third time and the sixth time,

wherein the first time is a time when the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when the first configuration or the fourth configuration is received,

wherein the third time is a time when the one or more CHO execution conditions for CHO with candidate SCGs is fulfilled, and

wherein the sixth time is a time when the access to the target PSCell associated with the second target PCell is failed.

17. The UE of claim 15, wherein the type of a first fulfilled execution condition for the CHO with candidate SCGs indicates that the first fulfilled execution condition for the CHO with candidate SCGs belongs to the one or more CPAC execution conditions for the CHO with candidate SCGs, and the second failure information further comprises one of:

an ID indicating a candidate PCell and an ID of a candidate PSCell associated with the candidate PCell, wherein the candidate PCell does not fulfil one of the one or more CHO execution conditions for CHO with candidate SCGs, and the candidate PSCell fulfills one of the one or more CPAC execution conditions for CHO with candidate SCGs,

a time length between a first time and a second time,

a time length between a fourth time and the second time,

a time length between the fourth time and the first time,

a time length between the first time and a sixth time,

a time length between the second time and the sixth time, or

a time length between the fourth time and the sixth time,

wherein the first time is a time the at least one CHO execution condition for CHO with SCG is fulfilled,

wherein the second time is a time when the first configuration or the fourth

configuration is received, and

wherein the fourth time is a time when the one or more CPAC execution conditions for CHO with candidate SCGs is fulfilled, and

wherein the sixth time is a time when the access to the target PSCell associated with the second target PCell is failed.

18. A first radio access network (RAN) node comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the first RAN node to:

transmit, to a user equipment (UE), a first configuration comprising one or more conditional handover (CHO) execution conditions for CHO with candidate secondary cell groups (SCGs) and one or more conditional primary SCG cell (PSCell) addition and change (CPAC) execution conditions for CHO with candidate SCGs; and

transmit, to the UE, a second configuration comprising at least one time threshold, the at least one time threshold being used for determining whether to store or report first information associated with a successful CHO with candidate SCGs procedure.

19. A target master node (MN) comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause the target MN to:

receive, from a user equipment (UE) or a second radio access network (RAN) node, first information or second information, the UE being configured with one or more conditional handover (CHO) execution conditions for CHO with candidate secondary cell groups (SCGs) and one or more conditional primary SCG cell (PSCell) addition and change (CPAC) execution conditions for CHO with candidate SCGs, the second RAN node being a target secondary node (SN) or a further RAN node; and

perform a mobility robustness optimization (MRO) analysis based on the first information or the second information.

20. A source secondary node (SN) comprising:

at least one memory; and

at least one processor coupled with the at least one memory and configured to cause

the source SN to:

determine time related information comprising one of:

at least one latest configured timer value for T310 or T312, or

a fifth time threshold associated with T310 trigger condition for a source PSCell, or

a sixth time threshold associated with T312 trigger condition for a source PSCell; and

transmit, to a source master node (MN), the time related information.