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TERMINAL APPARATUS, BASE STATION APPARATUS, CONTROL METHOD, AND COMPUTER-READABLE STORAGE MEDIUM FOR EXECUTING CONDITIONAL HANDOVER

Abstract

A terminal apparatus obtains, from a base station apparatus that is currently connected to the terminal apparatus, a communication parameter that is to be used when the terminal apparatus is connected to a candidate base station apparatus that is a candidate for handover destination and a condition for executing handover to the candidate base station apparatus; and transmits, to the candidate base station apparatus, a message that includes identification information associated with the obtained communication parameter, when handover to the candidate base station apparatus is performed based on the obtained condition.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) [0001] This application is a continuation of International Patent Application No. PCT/JP2020/034028 filed on Sep. 9, 2020, which claims priority to and the benefit of Japanese Patent Application No. 2019-183267 filed Oct. 3, 2019, the entire disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a terminal apparatus, a base station apparatus, a control method, and a program, and in particular relates to a conditional handover technique.

Description of the Related Art

[0003] In a cellular communication system, handover processing for sequentially switching base station apparatuses to which a terminal apparatus is connected is executed in order to maintain connection even when the terminal apparatus moves. In order to shorten the period of a switch, by such handover processing, of a base station apparatus to which the terminal apparatus is connected a technique has been discussed in which a communication parameter for communication between a base station apparatus that is a handover source and a base station apparatus that is a handover destination and a condition on which handover is to be executed are provided to the terminal apparatus in advance, and when the terminal apparatus confirms that the condition is satisfied, handover is autonomously executed. This technique is called conditional handover. In conditional handover, a base station apparatus that is a handover source inquires of base station apparatuses that are candidates for handover destination about respective communication parameters that are to be used for communication with a terminal apparatus, and obtains communication parameters when these candidate base station apparatuses and the terminal apparatus are connected (see 3GPP contribute articles, R2-1906209 and R3-193147). The base station apparatus that is a handover source then notifies the terminal apparatus of these communication parameters. In addition, a communication parameter that is to be used by a terminal apparatus for communication with a base station apparatus that is a handover candidate can be changed before handover is actually executed (see 3GPP contribute article, R2-1909676).

[0004] There can be cases where, when a communication parameter that is to be used by a terminal apparatus for communication with a base station apparatus that is a handover candidate is changed, before the change of the communication parameter is notified to the terminal apparatus, the terminal apparatus executes conditional handover using a communication parameter before the change. In this case, parameter mismatch can occur as a result of the candidate base station apparatus using the changed communication parameter while the terminal apparatus uses the communication parameter before the change.

SUMMARY OF THE INVENTION

[0005] The present invention provides a technique for preventing mismatch between communication parameters that are respectively used by a terminal apparatus and a base station apparatus that is a handover destination during conditional handover.

[0006] A terminal apparatus according to one mode of the present invention includes: an obtaining unit configured to obtain, from a base station apparatus that is currently connected to the terminal apparatus, a communication parameter that is to be used when the terminal apparatus is connected to a candidate base station apparatus that is a candidate for handover destination and a condition for executing handover to the candidate base station apparatus; and a transmitting unit configured to transmit, to the candidate base station apparatus, a message that includes identification information associated with the communication parameter, when handover to the candidate base station apparatus is performed based on the condition.

[0007] A base station apparatus according to one mode of the present invention is a base station apparatus that is a candidate for destination of handover to be performed by a terminal apparatus, the base station apparatus including: a notification unit configured to notify the terminal apparatus of a communication parameter that is to be used when the terminal apparatus is connected to the base station apparatus, via another base station apparatus that is currently connected to the terminal apparatus; a receiving unit configured to receive, from the terminal apparatus, a message that includes identification information associated with the communication parameter notified from the other base station apparatus to the terminal apparatus, when the terminal apparatus executes handover to the base station apparatus; and a communication unit configured to communicate with the terminal apparatus using the communication parameter if the identification information included in the message is associated with the communication parameter notified by the notification unit.

[0008] Further features of the present invention will become apparent from the following description of exemplary embodiments (with reference to the attached drawings).

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain principles of the invention.

[0010] FIG. 1 is a diagram showing a configuration example of a wireless communication system.

[0011] FIG. 2 is a diagram showing an exemplary hardware configuration of a base station apparatus and a terminal apparatus.

[0012] FIG. 3 is a diagram showing a configuration example of a base station apparatus that is a candidate for handover destination.

[0013] FIG. 4 is a diagram showing a configuration example of a terminal apparatus.

[0014] FIG. 5 is a diagram showing a configuration example of a base station apparatus that is a handover source.

[0015] FIG. 6 is a diagram showing an example of flow of processing that is executed by the system.

[0016] FIG. 7 is a diagram showing an example of flow of processing that is executed by the system.

[0017] FIG. 8 is a diagram showing an example of flow of processing that is executed by the system.

DESCRIPTION OF THE EMBODIMENTS

[0018] Hereinafter, embodiments will be described in detail with reference to the attached drawings. Note, the following embodiments are not intended to limit the scope of the claimed invention, and limitation is not made to an invention that requires a combination of all features described in the embodiments. Two or more of the multiple features described in the embodiments may be combined as appropriate. Furthermore, the same reference numerals are given to the same

or similar configurations, and redundant description thereof is omitted.

System Configuration

[0019] FIG. 1 shows a configuration example of a wireless communication system according to an embodiment of the present invention. Note that, in the example in FIG. 1, two base station apparatuses and one terminal apparatus are illustrated, but, as a matter of course, there may be a larger number of base station apparatuses and terminal apparatuses than those illustrated.

[0020] A base station apparatus **101** and a base station apparatus **102** are wireless base station apparatuses in a fifth-generation (5G) cellular communication system, for example. The base station apparatuses **101** and **102** are configured to be communicable with a terminal apparatus that is present in a cell **111** and a cell **112** that respectively represent ranges in which the base station apparatuses **101** and **102** can perform communication. A terminal apparatus **121** is connected to a base station apparatus that provides a cell that includes a position at which the terminal apparatus **121** is present, and thereby can perform wireless communication. Note that the terminal apparatus **121** can suppress the power consumption by transitioning to a standby state (for example, an RRC_Idle state or an RRC_Inactive state) when there is no user data that is to be transmitted/received, but, in the present embodiment, the terminal apparatus **121** enters a connection state (for example, an RRC_Connected state), establishes connection with a base station apparatus, and performs communication.

[0021] In the present embodiment, it is assumed that the terminal apparatus **121** moves while being connected to the base station apparatus **101** that forms the cell **111**, and enters the range of the cell **112** that is formed by the base station apparatus **102**. In this case, as the terminal apparatus **121** moves, the wireless quality of wireless communication with the base station apparatus **101** deteriorates and the wireless quality of a wireless signal from the base station apparatus **102** improves, and thereby the terminal apparatus **121** performs a switch of base station apparatus to which the terminal apparatus **121** is connected, that is in other words handover. At this time, this handover may be performed by a handover source, namely the base station apparatus **101** transmitting a handover instruction to the terminal apparatus **121**, but handover may be autonomously started when it is determined that a predetermined condition is satisfied by the terminal apparatus **121**. Autonomous handover that is performed when the condition is satisfied by the terminal apparatus **121** may be called “conditional handover”. In the present embodiment, the terminal apparatus **121** executes this conditional handover.

[0022] In conditional handover, for each of one or more candidate base station apparatuses that are candidates for handover destination, the terminal apparatus **121** obtains information regarding a communication parameter that is to be used when the terminal apparatus **121** is connected to that candidate base station apparatus, from the base station apparatus **101** that the terminal apparatus **121** is currently connected. Note that, in the present embodiment, the base station apparatus **102** is the candidate base station apparatus. In an example, a communication parameter is a parameter for wireless resource control (RRC) and includes a frequency bandwidth that is used for communication, the number of layers of MIMO (Multi-Input Multi-Output), and the like.

[0023] This information regarding a communication parameter may be information regarding a communication parameter that can be used by a candidate base station apparatus, and with which the base station apparatus **101** that is currently connected to the terminal apparatus **121** can achieve the communication quality achieved in communication that is currently executed with the terminal apparatus **121**, and, for example. Thus, for example, the base station apparatus **101** that is currently connected to the terminal apparatus **121** may provide a communication parameter that is currently used with the terminal apparatus **121**, to the candidate base station apparatus (the base station apparatus **102**), and obtain a communication parameter that can achieve communication performance similar to that corresponding to the provided communication parameter, from the candidate base station apparatus, as a communication parameter that is to be used when the terminal apparatus **121** and the candidate base station apparatus are connected. The base station

apparatus **102** may notify the base station apparatus **101** of the same communication parameter as the communication parameter notified from the base station apparatus **101**, for example. In addition, the base station apparatus **102** may notify the base station apparatus **101** of a communication parameter that is significantly different from the same communication parameter as the communication parameter notified from the base station apparatus **101**, but that can achieve the same communication performance, or may notify the base station apparatus **101** of a communication parameter only a portion of which is different from the communication parameter notified from the base station apparatus **101**, for example. In an example, the base station apparatus **102** may notify the base station apparatus **101** of information indicating the difference from the communication parameter notified from the base station apparatus **101**. In addition, the base station apparatus **102** may, for example, periodically notify the base station apparatus **101** of a communication parameter that is to be used, without being notified of a communication parameter from the base station apparatus **101**. In this manner, the base station apparatus **101** transfers information regarding a communication parameter obtained from the base station apparatus **102** to the terminal apparatus **121**.

[0024] The terminal apparatus **121** executes processing for autonomously switching a base station apparatus to which the terminal apparatus **121** is connected, to the base station apparatus **102**, for example, in accordance with a condition that the wireless quality of a wireless signal from the base station apparatus **102** is sufficiently higher than the wireless quality of a wireless signal from the base station apparatus **101** being satisfied by using this information regarding the communication parameter. In conditional handover, the terminal apparatus **121** transmits a handover success message (for example, an “RRC Reconfiguration Complete” message) to the base station apparatus **102** in accordance with a determination that handover to the base station apparatus **102** is to be performed, and handover is completed by the base station apparatus **102** accepting this message.

[0025] Here, information regarding a condition for the terminal apparatus **121** to execute handover is notified to the terminal apparatus **121** by the base station apparatus **101** (a handover source) that is currently connected to the terminal apparatus **121**. The base station apparatus **101** may notify that a value obtained by subtracting the wireless quality of a wireless signal from the base station apparatus **101** from the wireless quality of a wireless signal from the base station apparatus **102** measured by the terminal apparatus **121** needs to exceed a predetermined value, as a condition of handover, for example. At this time, the base station apparatus **101** may set the same predetermined value for all of the candidate base station apparatuses, for example, but may set a predetermined value different for each candidate base station apparatus. The base station apparatus **101** specifies wireless quality at which communication that uses a communication parameter notified from each candidate base station apparatus will be sufficiently successful, based on the communication parameter, and may set a higher predetermined value for higher wireless quality, for example. A configuration may be adopted in which, for example, the predetermined value is set higher for a candidate base station apparatus whose communication parameter represents a high likelihood of failure in demodulating a signal due to the number of layers of MIMO being large, such that handover is started after wireless quality on the candidate base station apparatus side is sufficiently high. In addition, a configuration may also be adopted in which the predetermined value is set higher for a candidate base station apparatus that uses a communication parameter that cannot achieve the communication performance achieved in the current communication, making it difficult for the terminal apparatus **121** to perform handover to the candidate base station apparatus. This enables the terminal apparatus **121** to be connected to a candidate base station apparatus that can achieve the same communication performance as the current communication performance. In addition, if there is a candidate base station apparatus that is to be preferentially connected, the base station apparatus **101** may set the predetermined value for the candidate base station apparatus lower, making it easy to perform handover to this candidate base station apparatus. Note that a condition that is always constant may be used, and, in this case, information regarding the

condition does not need to be notified from the base station apparatus **101** to the terminal apparatus **121**.

[0026] In communication with the terminal apparatus **121**, for example, the base station apparatus **101** may change the communication parameter, for example, addition of a wireless bearer during communication. In such a case, for example, the base station apparatus **101** may notify a candidate base station apparatus (the base station apparatus **102**) of the changed communication parameter, obtain, from that candidate base station apparatus, a changed communication parameter that is to be used when connected to the terminal apparatus **121**, and notify the terminal apparatus **121** of the changed communication parameter. Accordingly, in conditional handover, the terminal apparatus **121** can establish connection with the candidate base station apparatus using the changed communication parameter.

[0027] On the other hand, in conditional handover, the base station apparatus **101** and the base station apparatus **102** cannot be aware of, in advance, the timing when the condition is satisfied in the terminal apparatus **121**. Thus, handover may occur during processing for changing the communication parameter, and mismatch of communication parameters may occur between the terminal apparatus **121** and the base station apparatus **102** that is a handover destination.

[0028] If, for example, handover processing is started during a period from when the base station apparatus **102** transmits a changed communication parameter to the base station apparatus **101** until when the communication parameter reaches the terminal apparatus **121**, the terminal apparatus **121** may use a communication the parameter before the change to communicate with the base station apparatus **102**, and the base station apparatus **102** may use the changed communication parameter. Such an event may occur, for example, when handover is executed while the wireless quality between the base station apparatus **101** and the terminal apparatus **121** is reduced and the terminal apparatus **121** is failing to receive the changed communication parameter. In this case, communication parameters that are used by the terminal apparatus **121** and the base station apparatus **102** are different, and thus communication between these apparatuses cannot be performed.

[0029] In addition, when the terminal apparatus **121** successfully receives a changed communication parameter, the terminal apparatus **121** transmits, to the base station apparatus **101**, information indicating that the changed communication parameter was successfully received, and the base station apparatus **101** transfers the information to the base station apparatus **102**, whereby, when the terminal apparatus **121** performs handover in a state where the base station apparatus **102** has not received the information, the base station apparatus **102** can use a communication parameter before change. However, for example, there are cases where, in spite of a fact that the terminal apparatus **121** has successfully received a changed communication parameter, the base station apparatus **101** fails to receive information indicating that the changed communication parameter has been successfully received, and, as a result, such information is not transmitted to the base station apparatus **102**. In this case, the terminal apparatus **121** uses the changed communication parameter, while the base station apparatus **102** that is a handover destination uses the communication parameter before change, and thus communication between these apparatuses fails.

[0030] In the present embodiment, in order to prevent such communication parameter mismatch, when the terminal apparatus **121** executes handover, identification information associated with a communication parameter that is to be used after handover is notified to the base station apparatus **102** that is a handover destination. Notification of this identification information is included in a handover success message, for example.

[0031] In accordance with a communication parameter being received from the base station apparatus **101** to which the terminal apparatus **121** is currently connected, for example, the terminal apparatus **121** generates identification information corresponding to the communication parameter, and notifies the base station apparatus **101** of the generated identification information. In addition,

the base station apparatus **101** may notify the base station apparatus **102** of the notified identification information. That is to say, the terminal apparatus **121** may notify the generated identification information to a candidate base station apparatus that has determined a communication parameter corresponding to the identification information, via the base station apparatus **101** to which the terminal apparatus **121** is currently connected. The terminal apparatus **121** then transmits, to the base station apparatus **102** that is a handover destination, a handover success message that includes identification information corresponding to the most recent communication parameter that the terminal apparatus **121** has, regarding the base station apparatus **102** that is a handover destination, for example. Accordingly, as a result of the terminal apparatus **121** transmitting the identification information in the handover success message, the base station apparatus **102** that is a handover destination can recognize which communication parameter the terminal apparatus **121** is to use for connection with the base station apparatus **102**. If, for example, the received identification information is associated with the most recent communication parameter that is managed by the base station apparatus **102**, the base station apparatus **102** can recognize that the terminal apparatus **121** is attempting communication that uses the communication parameter, and can execute communication that uses the communication parameter after handover. On the other hand, for example, a configuration may be adopted in which, if the identification information is associated with a past first communication parameter, which is updated to a second communication parameter, but identification information associated with the (second) communication parameter has not been received, the base station apparatus **102** performs communication using the second communication parameter when unknown identification information is received from the terminal apparatus **121**. In addition, when a handover success message to which unknown identification information is added is received, the base station apparatus **102** may discard the message. In addition, the base station apparatus **102** may separately notify the terminal apparatus **121** of a communication parameter that is to be used, for example. [0032] In addition, a configuration may also be adopted in which the base station apparatus **102** that is a candidate for handover destination generates identification information along with communication parameters, and notify the terminal apparatus **121** thereof via the base station apparatus **101**. In this case, identification information is associated with all of the generated communication parameters, and thus the base station apparatus **102** can appropriately select a communication parameter that is to be used, based on identification information included in a handover success message from the terminal apparatus **121**. Assuming that, for example, first identification information is associated with the first communication parameter and second identification information is then associated with the second communication parameter to which the first communication parameter is updated, when a handover success message that includes the first identification information is received, the base station apparatus **102** can communicate with the terminal apparatus **121** using the first communication parameter. Note that, if a handover success message that includes unknown identification information is received, the base station apparatus **101** may discard the message. In addition, if a handover success message that includes first identification information associated with a past communication parameter is received, the base station apparatus **102** may discard the message.

[0033] In addition, the base station apparatus **102** notifies the first identification information associated with a communication parameter, to the base station apparatus **101** that is currently connected to the terminal apparatus **121**, and the base station apparatus **101** generates second identification information associated with the first identification information, and share it with the terminal apparatus **121**. When the handover condition is satisfied, the terminal apparatus **121** transmits a handover success message that includes this second identification information, to the base station apparatus **102**. Note that the second identification information may be, for example, an RRC Transaction ID in an RRC message when the base station apparatus **101** notifies the terminal apparatus **121** of a communication parameter. That is to say, when a communication parameter is

notified to the terminal apparatus **121**, an RRC message is transmitted, and an RRC Transaction ID is given to the message. Thus, this RRC Transaction ID may be used as the second identification information. Upon receiving a handover success message that includes the second identification information, the base station apparatus **102** notifies the base station apparatus **101** of the second identification information. Then, the base station apparatus **101** may notify the base station apparatus **102** of third identification information associated with the second identification information. If the third identification information matches the first identification information, the base station apparatus **102** specifies that a communication parameter associated with the first identification information is being used by the terminal apparatus **121**. In this manner, the base station apparatus **102** can specify which communication parameter the received identification information is associated with, via the base station apparatus **101** that is a handover source. [0034] In this manner, when executing conditional handover, the terminal apparatus **121** notifies the base station apparatus **102** that is a handover destination of identification information associated with a communication parameters that the terminal apparatus **121** could receive. Accordingly, the base station apparatus **102** can recognize that the terminal apparatus **121** is about to perform post-handover communication using the communication parameter associated with this identification information. Then, the base station apparatus **102** can communicate with the terminal apparatus **121** that performed handover, using the communication parameter associate with the identification information. The base station apparatus **102** holds histories of past communication parameters, for example, whereby, when identification information associated with a past communication parameter is received, the base station apparatus **102** can communicate with the terminal apparatus **121** using the past communication parameter. Note that the base station apparatus **102** does not need to hold past communication parameters, and, in this case, when a handover success message that includes identification information associated with a past communication parameter is received, the message can be discarded. Similarly, a handover success message that includes identification information that the base station apparatus **102** cannot recognize is received, the base station apparatus **102** may discard the message. Accordingly, communication can be prevented from being attempted in a state where communication parameters do not match between the terminal apparatus **121** and the base station apparatus **102**.

Apparatus Configuration

[0035] FIG. 2 shows an exemplary hardware configurations of a base station apparatus (the base station apparatus **101** of the base station apparatus **102**) and a terminal apparatus according to the present embodiment. These apparatuses each includes a processor **201**, a ROM **202**, a RAM **203**, a storage device **204**, and a communication circuit **205**, in an example. The processor **201** is a computer constituted by one or more processing circuits such as a general-purpose CPU (Central Processing Unit) and an ASIC (application-specific integrated circuit), and executes overall processing of the base station apparatuses/terminal apparatus and each process described above by reading out and executing a program stored in the ROM **202** or the storage device **204**. The ROM **202** is a read only memory that stores information such as programs and various parameters related to processing that is performed by the base station apparatus/terminal apparatus. The RAM **203** is a random access memory that functions as a work space when the processor **201** executes a program, and stores temporary information. The storage device **204** is constituted by a detachable external storage apparatus, for example. The communication circuit **205** is constituted by a circuit for wireless communication, for example. The base station apparatuses/terminal apparatus are each constituted by, for example, a baseband circuit, an RF circuit, and the like for cellular communication and an antenna, as the communication circuit **205** for communication with another apparatus. Note that FIG. 2 illustrates one communication circuit **205**, but the base station apparatuses/terminal apparatus may each include a plurality of communication circuits. In addition to the communication circuit for communication with the terminal apparatus, for example, each base station apparatus may include a wired or wireless communication circuit for communication

with another base station apparatus. Moreover, in addition to the communication circuit for communication with the base station apparatuses, the terminal apparatus may include a communication circuit for a wireless LAN, for example.

[0036] FIG. 3 shows an exemplary functional configuration of a base station apparatus (the base station apparatus **102**) that is a handover candidate according to the present embodiment. The candidate base station apparatus includes, as functions thereof, a communication unit **301**, a communication parameter generation unit **302**, an information holding unit **303**, and a parameter-to-be-used determination unit **304**, for example. Note that these functions may be realized by the processor **201** executing a program stored in the ROM **202** or the storage device **204**, or may also be realized by dedicated hardware, for example. FIG. 3 illustrates functions related to a technique according to the present embodiment, and the base station apparatus has functions of an ordinary base station apparatus as a matter of course.

[0037] The communication unit **301** is a function unit for executing wireless communication with the terminal apparatus **121**, for example. The communication unit **301** can perform wireless communication, for example, using a wireless communication method according to which a terminal apparatus can execute handover to an adjacent base station apparatus, such as a fifth generation cellular communication method. Note that, in the present embodiment, a fifth generation cellular communication method is used, but a communication method of each generation such as a third-generation wireless communication method, a long-term evolution communication method, or a fifth generation or later wireless communication method may be used, and a communication method other than a cellular communication method may also be used. In addition, the communication unit **301** also has a function of executing wired or wireless communication with another base station apparatus (the base station apparatus **101**). The communication unit **301** performs communication with another base station apparatus through an interface between base station apparatuses stipulated by a cellular communication standard, for example

[0038] The communication parameter generation unit **302** generates a communication parameter that is to be used for communication when the terminal apparatus **121** is connected to the base station apparatus **102**. The communication parameter generation unit **302** generates a communication parameter, for example, in accordance with the terminal apparatus **121** receiving a handover request for conditional handover from the base station apparatus **101** to which the terminal apparatus **121** is currently connected, adds information regarding the generated communication parameter to a response signal to the handover request, and transmits the response signal. Note that the handover request may include information regarding a communication parameter that is being used by the base station apparatus **101** for communication with the terminal apparatus **121**, and, in this case, the communication parameter generation unit **302** can generate a communication parameter that is to be used for communication when the terminal apparatus **121** is connected to the base station apparatus **102**, based on this received communication parameter. The communication parameter generation unit **302** generates a communication parameter, for example, such that communication performance that is equivalent to communication performance obtained in communication between the base station apparatus **101** and the terminal apparatus **121** can be achieved. Then, the communication parameter generation unit **302** may notify the base station apparatus **101** of the value of the difference between the communication parameter received from the base station apparatus **101** and the generated communication parameter, for example. In this case, the base station apparatus **101** specifies a communication parameter that is to be used by the base station apparatus **102**, based on the communication parameter notified to the base station apparatus **102** and the value of the difference (for example, by adding these values). Note that the communication parameter generation unit **302** may notify the base station apparatus **101** of the generated communication parameter itself. Note that a configuration may also be adopted in which the communication parameter generation unit **302** generates a communication parameter and identification information associated with the communication parameter, and notify the base station

apparatus **101** thereof. Note that the communication parameter (and identification information as necessary) notified to the base station apparatus **101** is transferred to the terminal apparatus **121** by the base station apparatus **101**. Note that identification information may be generated by the base station apparatus **101**, and, in this case, for example, the identification information may be notified to the base station apparatus **102** at the time of a handover request. In this case, the communication parameter generation unit **302** does not need to generate identification information.

[0039] The information holding unit **303** holds a communication parameter generated by the communication parameter generation unit **302** and identification information associated with the communication parameter. Note that, for example, when storing identification information generated by the communication parameter generation unit **302**, the information holding unit **303** stores the identification information and the communication parameter generated along with that identification information in association. In addition, when identification information notified from the terminal apparatus **121** via the base station apparatus **101** is obtained, the information holding unit **303** stores the identification information in association with the previous communication parameter transmitted to the terminal apparatus **121** via the base station apparatus **101**.

[0040] The parameter-to-be-used determination unit **304** determines a communication parameter that is to be used for communication with the terminal apparatus **121**, based on identification information included in a handover success message from the terminal apparatus **121**. If the received identification information is held in the information holding unit **303**, the parameter-to-be-used determination unit **304** determines a communication parameter associated with that identification information, as a communication parameter that is to be used for communication with the terminal apparatus **121**, for example. In addition, if the received identification information is not held in the information holding unit **303** and the most recent communication parameter that is not associated with identification information is present, the parameter-to-be-used determination unit **304** determines that this communication parameter is a communication parameter to be used for communication with the terminal apparatus **121**. Note that, if the received identification information is not held in the information holding unit **303**, the parameter-to-be-used determination unit **304** may discard the handover success message. In addition, a configuration may be adopted in which the parameter-to-be-used determination unit **304** transfers, to the base station apparatus **101**, identification information included in the handover success message from the terminal apparatus **121**, obtains other identification information from the base station apparatus **101**, and determines a communication parameter that is to be used, in accordance with whether or not the other identification information is held in the information holding unit **303**. If the other identification information obtained from the base station apparatus **101** is held in the information holding unit **303**, for example, the parameter-to-be-used determination unit **304** determines that a communication parameter associated with the other identification information is a communication parameter that is to be used for communication with the terminal apparatus **121**. In addition, if the other identification information obtained from the base station apparatus **101** is not held in the information holding unit **303**, the parameter-to-be-used determination unit **304** may discard the handover success message. In addition, a configuration may be adopted in which, if the other identification information obtained from the base station apparatus **101** is not held in the information holding unit **303**, the parameter-to-be-used determination unit **304** generates a communication parameter that is to be used for communication with the terminal apparatus **121**, notifies the terminal apparatus **121** of the communication parameter as a response to the handover success message, and starts communication. At this time, the base station apparatus **102** may inquire the base station apparatus **101** about a communication parameter used for communication with the terminal apparatus **121** and generate a communication parameter for communication with the terminal apparatus **121**.

[0041] FIG. **4** is a diagram showing an exemplary functional configuration of a terminal apparatus. The terminal apparatus includes a communication unit **401**, an information obtaining unit **402**, a

condition determination unit **403**, and a message generation unit **404**, for example. Functions of these units may be realized by the processor **201** executing a program stored in the ROM **202** or the storage device **204**, for example, or may also be realized by dedicated hardware. Note that FIG. 4 illustrates functions related to a technique according to the present embodiment, and the terminal apparatus has functions of an ordinary terminal apparatus as a matter of course.

[0042] The communication unit **401** is a function unit for executing wireless communication with a base station apparatus, for example. The communication unit **401** can perform wireless communication by using a wireless communication method according to which a terminal apparatus can move to an adjacent cell, in a cellular communication method of each generation such as a third generation wireless communication method, a long term evolution communication method, or a fifth generation wireless communication method. Note that a method other than the cellular communication method may also be used.

[0043] Regarding at least one candidate base station apparatus (for example, the base station apparatus **102**) that is a candidate for handover destination, the information obtaining unit **402** obtains information regarding a communication parameter that is to be used when connected to the candidate base station apparatus, from the base station apparatus **101** that is currently connected to the terminal apparatus. Note that this communication parameter is received, for example, from each candidate base station apparatus via the base station apparatus **101** that is currently connected to the terminal apparatus. In addition, the information obtaining unit **402** may obtain a condition for autonomously starting handover, for example, from the base station apparatus **101** that is currently connected to the terminal apparatus. Note that the condition may be defined for each candidate base station apparatus or may be defined in common with some or all candidate base station apparatuses. In addition, if identification information associated with a communication parameter is generated by each candidate base station apparatus, the information obtaining unit **402** may obtain the identification information along with the communication parameter. In addition, when a communication parameter from one of the candidate base station apparatuses is obtained, the information obtaining unit **402** may generate and obtain identification information associated with that communication parameter, for example. When identification information is generated in this manner, the generated identification information is notified to the base station apparatus **101** by the message generation unit **404** to be described later, before handover is executed. When a communication parameter is received in an RRC Reconfiguration message from the base station apparatus **101**, identification information may be notified to the base station apparatus **101** by an RRC Reconfiguration Complete message that is a response to that message, for example.

[0044] In addition, when a candidate base station apparatus generated identification information, the information obtaining unit **402** may share other identification information different from this identification information, with the base station apparatus **101** that is currently connected to the terminal apparatus. The information obtaining unit **402** may obtain an RRC Transaction ID of an RRC message when obtaining information regarding a communication parameter of a candidate base station apparatus from the base station apparatus **101**, as the other identification information, for example. In addition, a configuration may be adopted in which, as described above, the information obtaining unit **402** generates and obtains other identification information in accordance with a communication parameter being received, and notifies the generated identification information to the base station apparatus **101**, thereby sharing this other identification information with the base station apparatus **101**.

[0045] The condition determination unit **403** determines whether or not a condition for starting handover obtained by the information obtaining unit **402** has been satisfied, for example. The condition determination unit **403** measures the wireless quality of a wireless signal from the base station apparatus **102** and the wireless quality of a wireless signal from the base station apparatus **101** that is currently connected to the terminal apparatus, and determines whether or not to start handover, based on the measured value and the condition notified in relation to the base station

apparatus **102**, for example. The condition determination unit **403** can determine that handover is to be started, for example, when the difference between the wireless quality of a wireless signal from the base station apparatus **102** and the wireless quality of a wireless signal from the base station apparatus **101** exceeds a predetermined value, when the wireless quality of a wireless signal from the base station apparatus **101** is lower than a predetermined level, when the wireless quality of a wireless signal from the base station apparatus **102** exceeds a predetermined level, and the like.

[0046] When the condition for conditional handover is satisfied and handover processing is started, the message generation unit **404** generates a handover success message that includes identification information associated with the communication parameter notified from the base station apparatus that is a destination of the handover, for example. When the communication parameter and the identification information are received from the base station apparatus **102** (via the base station apparatus **101**), the message generation unit **404** generates a handover success message that includes the identification information, for example. In addition, also when the terminal apparatus generates identification information in accordance with a communication parameter being received from the base station apparatus **102**, the message generation unit **404** may generate a handover success message that includes this identification information. Note that, in this case, the message generation unit **404** may generate a message for notifying the base station apparatus **101** of the identification information, in accordance with a communication parameter being received, before handover processing is started. When a communication parameter that is to be used for communication with the base station apparatus **102** is received in an RRC Reconfiguration message from the base station apparatus **101**, for example, the message generation unit **404** generates an RRC Reconfiguration Complete message that includes identification information generated in association with the communication parameter. In addition, the message generation unit **404** may generate a handover success message that includes identification information (for example, an RRC Transaction ID) that is shared with the base station apparatus **101** only, for example. In this case, the base station apparatus **102** is not aware of that identification information in advance, but can recognize which communication parameter the handover success message corresponds to, by making an inquiry to the base station apparatus **101** that is a handover source. The handover success message generated by the message generation unit **404** is transmitted to the base station apparatus **102** via the communication unit **401**. In addition, for example, a message for performing notification of identification information may be transmitted to the base station apparatus **101**.

[0047] FIG. 5 is a diagram showing an exemplary functional configuration of the base station apparatus **101** that is a handover source. The base station apparatus **101** includes a communication unit **501**, an information transfer unit **502**, and an identification information notification unit **503**, for example. Functions of these units may be realized by the processor **201** executing a program stored in the ROM **202** or the storage device **204**, for example, or may be realized by dedicated hardware. Note that FIG. 5 illustrates functions related to the technique according to the present embodiment, and the terminal apparatus has functions of an ordinary terminal apparatus as a matter of course. Note that the base station apparatus operates as a base station apparatus that is a handover source when viewed from a terminal apparatus that is currently connected to the base station apparatus, and operates as a base station apparatus that is a handover destination when viewed from a terminal apparatus that is currently connected to another base station apparatus. Thus, the base station apparatus may be configured to have both of functions in FIGS. 3 and 5.

[0048] The communication unit **501** is similar to the communication unit **301** in FIG. 3. The information transfer unit **502** receives a communication parameter and identification information from a base station apparatus that is a handover candidate, and transfers the communication parameter and the identification information to a terminal apparatus, for example. In addition, when identification information is generated in accordance with the terminal apparatus receiving a communication parameter, the information transfer unit **502** may transfer the identification information generated by the terminal apparatus to the candidate base station apparatus. Note that

the information transfer unit **502** is configured to transfer at least a communication parameter received from the candidate base station apparatus, to the terminal apparatus, and does not need to transfer identification information. The identification information notification unit **503** receives, from a base station apparatus to which handover was performed by the terminal apparatus that has been connected to the base station apparatus (that includes this identification information notification unit **503**) to this point, identification information included in a handover success message transmitted from the terminal apparatus to the base station apparatus (that is a handover destination), for example, and specifies other identification information corresponding to the received identification information. The identification information notification unit **503** then notifies the specified other identification information, to the base station apparatus that is a handover destination. Note that, when identification information that is common between the base station apparatus that is a handover destination and the terminal apparatus is used, the identification information notification unit **503** may be omitted.

Flow of Processing

[0049] Next, several examples of flow of processing that is executed according to the present embodiment will be described. Note that the following processing is merely exemplary, and, for example, aforementioned deformations may be made, and information may be transmitted using a message that is different from various messages to be described below.

[0050] FIG. **6** shows an example in which the terminal apparatus **121** generates identification information in accordance with receiving a communication parameter. In this processing, as an initial state, the terminal apparatus **121** and the base station apparatus **101** are in a connection state (step **S601**), and are performing user data communication. At this time, for example, the base station apparatus **101** notifies a communication parameter A that is being used at this time point to the base station apparatus **102** that is a candidate for handover destination, and transmits a handover request message (step **S602**). The base station apparatus **102** then transmits, to the base station apparatus **101**, a response message that includes a communication parameter A1 that can achieve communication performance that is equivalent to the communication performance corresponding to this notified communication parameter, for example (step **S603**). The base station apparatus **101** transfers the obtained communication parameter A1 to the terminal apparatus **121** (step **S604**). Transfer of this communication parameter A1 can be performed using an RRC message such as an RRC Reconfiguration message. Note that, for example, the base station apparatus **101** can also perform notification of a condition for determining whether or not the terminal apparatus **121** also autonomously executes handover at the time of first notification of a communication parameter. Note that this is merely exemplary, and a communication parameter and a condition may be separately notified.

[0051] In accordance with receiving the communication parameter A1, the terminal apparatus **121** generates identification information a associated with the communication parameter A1, and notifies the identification information a to the base station apparatus **101** that is currently connected to the terminal apparatus **121** (step **S605**). This notification of the identification information a can be performed using an RRC message such as an RRC Reconfiguration Complete message. The base station apparatus **101** transfers the received identification information a to the base station apparatus **102** (step **S606**). Due to the procedure in steps **S602** to **S606**, the communication parameter A1 and the identification information a associated therewith are shared between the terminal apparatus **121** and the base station apparatus **102** that is a handover destination.

[0052] Thereafter, for example, when a change in the communication parameter such as an increase in the wireless bearer is performed between the base station apparatus **101** and the terminal apparatus **121** that is currently connected to the base station apparatus **101**, similarly to step **S602**, the base station apparatus **101** notifies the base station apparatus **102** of a changed communication parameter B (step **S607**). The base station apparatus **101** then obtains, from the base station apparatus **102**, information regarding a communication parameter B1 that corresponds to the

communication parameter B and is to be used for communication with the terminal apparatus **121** (step **S608**). The base station apparatus **101** then transfers this obtained communication parameter B1 to the terminal apparatus **121** (step **S609**). Note that, here, it is assumed that, for example, due to deterioration in the wireless environment, transfer of the communication parameter B1 from the base station apparatus **101** to the terminal apparatus **121** fails.

[0053] Here, it is assumed that the terminal apparatus **121** determines that the handover start condition is satisfied, before the communication parameter B1 is successfully received, and starts processing for performing handover to the base station apparatus **102**. In this case, the terminal apparatus **121** determines that the communication parameter A1 that is the most recent from among communication parameters received from the base station apparatus **102** via the base station apparatus **101** is to be used, for example. As a result, the terminal apparatus **121** transmits, to the base station apparatus **102**, a handover success message that includes the identification information a associated with the communication parameter A1 (step **S610**). Note that the handover success message can be a RRC Reconfiguration Complete message, for example. Upon receiving this message, the base station apparatus **102** confirms that the identification information a is included, and determines that communication with the terminal apparatus **121** is to be performed using the communication parameter A1 associated therewith. Accordingly, connection for communication that uses a parameter A1 is established between the terminal apparatus **121** and the base station apparatus **102**, (step **S611**).

[0054] Note that this processing example can also apply when the terminal apparatus **121** has started handover in a state where the communication parameter B1 cannot be received in step **S609**, but this communication parameter B1 has been successfully received, and when handover is started in a state where identification information b (not illustrated) associated with the communication parameter B1 does not reach the base station apparatus **101** (or the base station apparatus **102**). In step **S610**, for example, upon receiving a handover success message that includes the identification information b, the base station apparatus **102** may determine that the communication parameter B1 that is not associated with identification information is to be used since the identification information b is unknown identification information. In this case, connection for communication that uses a parameter B1 is established between the terminal apparatus **121** and the base station apparatus **102**. Note that, when a handover success message that includes unknown identification information is received, the base station apparatus **102** may discard this message. In addition, when a handover success message that includes unknown identification information is received, the base station apparatus **102** may newly generate a communication parameter that is to be used for communication with the terminal apparatus **121**, notify the terminal apparatus **121** of the generated communication parameter, and start communication.

[0055] In addition, in step **S606**, the base station apparatus **101** does not need to hold the received identification information a and transfer it to the base station apparatus **102**. In this case, for example, as will be described later with reference to FIG. 8, when a handover success message that includes the identification information a is received, the base station apparatus **102** may transmit this identification information a to the base station apparatus **101**, perform an inquiry, and specify the communication parameter A1 associated with the identification information a. Accordingly, connection for communication that uses the parameter A1 can be established between the terminal apparatus **121** and the base station apparatus **102**.

[0056] Next, a processing example in which, when generating a communication parameter, the base station apparatus **102** also generates identification information, and notifies the identification information to the base station apparatus **101** and the terminal apparatus **121** will be described with reference to FIG. 7. Note that processing similar to processing in FIG. 6 is given the same reference sign, and a description thereof is omitted.

[0057] In the present embodiment, when the communication parameter A1 that can achieve communication performance that is equivalent to the communication performance corresponding to

the communication parameter A received from the base station apparatus **101** is generated, the base station apparatus **102** generates the identification information a associated with the communication parameter A **1**. The base station apparatus **102** then notifies the base station apparatus **101** of the generated communication parameter A1 and the identification information a (step **S701**). The base station apparatus **101** then transfers this communication parameter A1 and the identification information a to the terminal apparatus **121** (step **S702**), and receives a response signal from the terminal apparatus **121** (step **S703**). Note that, in this processing example, at this time point, the communication parameter A1 and the identification information a associated therewith are shared between the terminal apparatus **121** and the base station apparatus **102**, and thus notification of information from the base station apparatus **101** to the base station apparatus **102** as in step **S606** does not need to be performed.

[0058] Subsequently, as a communication parameter of communication between the base station apparatus **101** and the terminal apparatus **121** is changed, the base station apparatus **102** generates a new communication parameter B1 and identification information b associated therewith, and performs notification to the base station apparatus **101** (step **S704**). The base station apparatus **101** then transfers this received information to the terminal apparatus **121** (step **S705**). Here, assuming that the terminal apparatus **121** started handover processing before this information is successfully received, similarly to the case in FIG. 6, the terminal apparatus **121** transmits, to the base station apparatus **102**, a handover success message that includes the identification information a associated with the communication parameter A1 (step **S610**), and connection for communication that uses the communication parameter A1 is established (step **S611**).

[0059] Note that, in this processing example, the terminal apparatus **121** successfully receives the communication parameter B1 and the identification information b thereof, but even when handover is started in a state where a response signal for notifying the success (not illustrated) does not reach the base station apparatus **101**, the relationship between the communication parameter B1 and the identification information b is shared between the terminal apparatus **121** and the base station apparatus **102**. Thus, when the terminal apparatus **121** transmits a handover success message that includes the identification information b, the base station apparatus **102** can determine that the communication parameter B1 associated with the identification information b is to be used.

[0060] Next, a processing example when identification information that is shared between the base station apparatus **101** and the base station apparatus **102** is different from identification information that is shared between the terminal apparatus **121** and the base station apparatus **101** will be described with reference to FIG. 8. Note that processing that is similar to the processing in FIG. 6 is given the same reference sign, and a description thereof is omitted.

[0061] In this processing example, the base station apparatus **102** generates the communication parameter A1 and the identification information a1 associated therewith, and performs notification to the base station apparatus **101** (step **S801**). The base station apparatus **101** stores this identification information a1, and, on the other hand, transfers the communication parameter A1 to the terminal apparatus **121** while sharing other identification information a2 with the terminal apparatus **121** (step **S802**). The base station apparatus **101** then receives a response signal from the terminal apparatus **121** (step **S803**). Note that the identification information a2 at this time may be generated by the base station apparatus **101** and notified to the terminal apparatus **121**, but may be identification information that is assigned during communication, such as an RRC Transaction ID. The base station apparatus **101** stores the identification information a2 shared with the terminal apparatus **121**, in association with the identification information a1 shared with the base station apparatus **102**. Similarly, when the communication parameter is changed, the base station apparatus **102** notifies the base station apparatus **101** of the communication parameter B1 and the identification information b1 associated therewith (step **S804**), and the base station apparatus **101** notifies the terminal apparatus **121** of the changed communication parameter B1 while sharing the other identification information b2 with the terminal apparatus **121** (step **S805**).

[0062] Here, it is assumed that the terminal apparatus **121** starts processing for performing handover to the base station apparatus **101**, before information regarding the communication parameter B1 is successfully received. In this case, when the communication parameter A1 was obtained immediately before, the terminal apparatus **121** transmits, to the base station apparatus **102**, a handover success message that includes the identification information a2 shared with the base station apparatus **101** (step **S806**). The base station apparatus **102** cannot interpret this identification information a2, thus transfers this identification information a2 to the base station apparatus **101** that is a handover source, makes an inquiry whether or not there is identification information associated with the identification information a2 from among identification information shared between the base station apparatus **101** and the base station apparatus **102** (step **S807**). In response to this inquiry, the base station apparatus **101** transmits the identification information a1 stored in association with the identification information a2, as a response to the inquiry, to the base station apparatus **102** (step **S808**). Accordingly, the base station apparatus **102** can recognize that the identification information a2 is associated with the communication parameter A1, and, as a result, connection for communication that uses the communication parameter A1 is established between the terminal apparatus **121** and the base station apparatus **101** (step **S611**).

[0063] As described above, a communication parameter that is to be used when the base station apparatus **102** communicates with the terminal apparatus **121** and identification information associated with the communication parameter are shared between the terminal apparatus **121** and the base station apparatus **102** (or the base station apparatus **101**) that is a candidate for handover destination, and conditional handover is executed using the identification information. Accordingly, communication parameter that is to be used by the terminal apparatus **121** can be accurately recognized by the base station apparatus **102** that is a handover destination, and thus it is possible to prevent communication between the terminal apparatus **121** and the base station apparatus **102** from being disabled after handover.

[0064] According to the present invention, it is possible to prevent mismatch between communication parameters that are respectively used by a terminal apparatus and a base station apparatus that is a handover destination during handover.

[0065] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions. [0066] **1-19.** (canceled).

Claims

20. A terminal apparatus comprising: one or more processors; and one or more memories that store a computer-readable instruction for causing, when executed by the one or more processors, the one or more processors to: receive, from a base station apparatus that is currently connected to the terminal apparatus, (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to a candidate base station apparatus that is a candidate for handover destination, (ii) identification information identifying the communication parameter for the RRC, and (iii) a condition for executing handover to the candidate base station apparatus; and transmit, to the candidate base station apparatus, a message that includes the identification information identifying the communication parameter, when handover to the candidate base station apparatus is performed based on the condition.

21. The terminal apparatus according to claim 20, wherein the communication parameter for the RRC and the identification information identifying the communication parameter for the RRC are transmitted from the candidate base station apparatus to the base station apparatus that is currently connected to the terminal apparatus.

- 22.** The terminal apparatus according to claim 20, wherein the communication parameter for the RRC, the identification information identifying the communication parameter for the RRC, and the condition are received from the base station apparatus that is currently connected to the terminal apparatus using a R RC Reconfiguration message.
- 23.** The terminal apparatus according to claim 22, wherein the message that includes the identification information, transmitted from the terminal apparatus to the candidate base station apparatus, is a RRC Reconfiguration Complete message and the identification information is a RRC Transaction ID.
- 24.** The terminal apparatus according to claim 20, wherein, in response to receiving the communication parameter for the RRC, the identification information identifying the communication parameter for the RRC, and the condition, the terminal apparatus transmits, to the base station apparatus that is currently connected to the terminal apparatus, a message that indicates that the reception of the communication parameter for the RRC is completed.
- 25.** The terminal apparatus according to claim 24, The message that indicates that the reception of the communication parameter for the RRC is completed is a RRC Reconfiguration Complete message.
- 26.** The terminal apparatus according to claim 20, wherein the communication parameter for the RRC includes at least one of a frequency bandwidth or a number of MIMO layers.
- 27.** A base station apparatus that is a candidate for destination of handover to be performed by a terminal apparatus, the base station apparatus comprising: one or more processors; and one or more memories that store a computer-readable instruction for causing, when executed by the one or more processors, the one or more processors to: notify another base station apparatus that is currently connected to the terminal apparatus of (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to the base station apparatus, and (ii) identification information identifying the communication parameter for the RRC; receive, from the terminal apparatus, a message that includes the identification information identifying the communication parameter for the RRC, notified from the other base station apparatus to the terminal apparatus, when the terminal apparatus executes handover to the base station apparatus; and communicate with the terminal apparatus using the communication parameter for the RRC identified by the identification information included in the received message.
- 28.** The base station apparatus according to claim 27, wherein, in response to a request from the other base station apparatus, the communication parameter for the RRC and the identification information identifying the communication parameter for the RRC are notified.
- 29.** The base station apparatus according to claim 28, wherein the request is a Handover Request, and the communication parameter for the RRC and the identification information identifying the communication parameter for the RRC are notified, to the other base station apparatus, using a Handover Request Ack.
- 30.** The base station apparatus according to claim 27, wherein the one or more processors are configured to communicate with the terminal apparatus using the communication parameter for the RRC that is notified, if the identification information that is notified matches the identification information included in the message.
- 31.** The base station apparatus according to claim 27, wherein the message that includes the identification information, transmitted from the terminal apparatus to the candidate base station apparatus, is a RRC Reconfiguration message and the identification information is a RRC Transaction ID.
- 32.** The base station apparatus according to claim 27, wherein the communication parameter for the RCC includes at least one of a frequency bandwidth or a number of MIMO layers.
- 33.** A control method executed by a terminal apparatus, comprising receiving, from a base station apparatus that is currently connected to the terminal apparatus, (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to a

candidate base station apparatus that is a candidate for handover destination, (ii) identification information identifying the communication parameter for the RRC, and (iii) a condition for executing handover to the candidate base station apparatus; and transmitting, to the candidate base station apparatus, a message that includes the identification information identifying the communication parameter, when handover to the candidate base station apparatus is performed based on the condition.

34. A control method executed by a base station apparatus that is a candidate for destination of handover to be performed by a terminal apparatus, the control method comprising: notifying another base station apparatus that is currently connected to the terminal apparatus of (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to the base station apparatus, and (ii) identification information identifying the communication parameter for the RRC; receiving, from the terminal apparatus, a message that includes the identification information identifying the communication parameter for the RRC, notified from the other base station apparatus to the terminal apparatus, when the terminal apparatus executes handover to the base station apparatus; and communicating with the terminal apparatus using the communication parameter for the RRC identified by the identification information included in the received message.

35. A non-transitory computer-readable storage medium that stores a program for causing a computer included in a terminal apparatus to: receive, from a base station apparatus that is currently connected to the terminal apparatus, (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to a candidate base station apparatus that is a candidate for handover destination, (ii) identification information identifying the communication parameter for the RRC, and (iii) a condition for executing handover to the candidate base station apparatus; and transmit, to the candidate base station apparatus, a message that includes the identification information identifying the communication parameter, when handover to the candidate base station apparatus is performed based on the condition.

36. A non-transitory computer-readable storage medium that stores a program for causing a computer included in a base station apparatus that is a candidate for destination of handover to be performed by a terminal apparatus to: notify another base station apparatus that is currently connected to the terminal apparatus of (i) a communication parameter for Radio Resource Control (RRC) that is to be used when the terminal apparatus is connected to the base station apparatus, and (ii) identification information identifying the communication parameter for the RRC; receive, from the terminal apparatus, a message that includes the identification information identifying the communication parameter for the RRC, notified from the other base station apparatus to the terminal apparatus, when the terminal apparatus executes handover to the base station apparatus; and communicate with the terminal apparatus using the communication parameter for the RRC identified by the identification information included in the received message.
