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(54) Title: METHOD, USER EQUIPMENT, BASE STATION, AND DEVICE WITH STORAGE FUNCTION FOR COMMUNICATION

Transmit a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing

S101

FIG. 1

(57) Abstract: The present disclosure discloses a method, a user equipment, a base station, and a device with storage function for communication. The method includes: transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request. Through the above-mentioned method, the present disclosure can resolve many different performance issues through a common architecture. The method is simple, which can save resources and enhance work efficiency.



METHOD, USER EQUIPMENT, BASE STATION, AND DEVICE
WITH STORAGE FUNCTION FOR COMMUNICATION

TECHNICAL FIELD

[0001] Embodiments of the present disclosure generally relate to communication technology, and in particular relate to a method, a user equipment, a base station, and a device with storage function for communication.

BACKGROUND

[0002] A user equipment can bring the performance into full capability when operates normally. But in the process of actual use, performance issues such as the performance degradation caused by over-heat and the in-device coexistence when the RF circuit operates with other wireless modules (e.g., WiFi, Bluetooth, and GPS) at the same time, that is, radio frequency coexistence, may be temporarily encountered due to the hardware or system limitations. When the user equipment encounters the performance issues, its processing capability may degrade, which results in a failure to completely utilize the operation mode configured for the user equipment by the base station, and causes the waste of resources.

SUMMARY

[0003] The main objective of the present disclosure is to provide a communication method and a user equipment, a base station, and a device with storage function for communication, which can resolve resource waste problems caused by performance issues of a user equipment.

[0004] In order to achieve the above-mentioned objective, a technical scheme

adopted by the present disclosure is: providing a communication method including transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request.

[0005] In order to achieve the above-mentioned objective, another technical scheme adopted by the present disclosure is: providing a communication method including receiving and analyzing a temporary performance changing request transmitted by a user equipment; adjusting an operation mode configured for the user equipment in response to the temporary performance changing request.

[0006] In order to achieve the above-mentioned objective, another technical scheme adopted by the present disclosure is: a user equipment, comprising a first processing circuit and a first communication circuit electrically coupled to each other, where the first processing circuit executes instructions in operation to implement the above-mentioned method.

[0007] In order to achieve the above-mentioned objective, another technical scheme adopted by the present disclosure is: a base station, comprising a second processing circuit and a second communication circuit electrically coupled to each other, the second processing circuit executing instructions in operation to implement the above-mentioned method.

[0008] In order to achieve the above-mentioned objective, another technical scheme adopted by the present disclosure is: a device with storage function, wherein the device is stored with instructions, and the instructions implement the above-mentioned method.

[0009] The present disclosure has the advantages that: different from the case of

the prior art, the user equipment of the present disclosure issues a temporary performance changing request to the base station when the user equipment itself emerges a performance issue, so as to request the base station to adjust the operation mode configured for the user equipment itself. The resources after the adjustment are more adaptive to the current performance of the user equipment, thereby improving the matching of the operation mode configured by the base station with the current performance of the user equipment so as to reduce the waste of resources.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG.1 is a flow chart of a first embodiment of a communication method of the present disclosure.

[0011] FIG.2 is a flow chart of a second embodiment of a communication method of the present disclosure.

[0012] FIG.3 is a flow chart of a third embodiment of a communication method of the present disclosure.

[0013] FIG.4 is a flow chart of a fourth embodiment of a communication method of the present disclosure.

[0014] FIG.5 is a flow chart of a fifth embodiment of a communication method of the present disclosure.

[0015] FIG.6 is a flow chart of a sixth embodiment of a communication method of the present disclosure.

[0016] FIG.7 is a schematic diagram of the structure of a user equipment according to an embodiment of the present disclosure.

[0017] FIG.8 is a schematic diagram of the structure of a base station according to an embodiment of the present disclosure.

[0018] FIG.9 is a flow chart of a seventh embodiment of a communication method

of the present disclosure.

[0019] FIG.10 is a flow chart of an embodiment of a communication method of the present disclosure.

[0020] FIG.11 is a schematic diagram of the structure of a device with storage function according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0021] The present disclosure will now be described in detail with reference to the accompanying drawings and embodiments.

[0022] Referring to FIG.1, a flow chart of a first embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0023] At S101: transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request.

[0024] The user equipment can bring the performance into full capability when it operates normally. But in the process of actual use, performance issues may be temporarily encountered due to the hardware or system limitations. Hence, the user equipment needs to adjust the current operation mode so that the adjusted operation mode can be more adapted to the current performance of the user equipment. However, the user equipment itself can not complete these adjustments independently, and needs the assistance of the base station. After the base station has adjusted the operation mode configured for the user equipment, the user equipment will be more matching the operation mode currently configured, thereby achieving the purpose of reducing

the waste of resources.

[0025] In a specific implementation scenario, the user equipment transmits the temporary performance changing request to the base station due to some performance issues caused by the hardware or system limitations. The temporary performance changing request includes at least one of a type of the performance issue, a triggering cause of the performance issue, status parameter(s) of the current user equipment, adjustment suggestion parameter(s) for the base station to configure the operation mode, and an effective time of the temporary performance changing request.

[0026] Wherein, the type of the performance issues can be hardware sharing issues, interference issues, or other user equipment anomalies (eg, the issue of over-heat). The triggering cause of the performance issue can be the cause of the user equipment itself, the cause of the exterior, or caused by other events. The status parameters of the current user equipment include various parameters with respect to the current operation status of the user equipment such as the temperature of the current user equipment, the suitable communication method of the current user equipment, the number of antennas used by the current user equipment, the number of carriers used by the current user equipment, and the radio frequency speed of the current user equipment. The status parameters of the current user equipment are provided according to the type of performance issues. For example, when the type of performance issue is over-heat, the status parameters of the current user equipment include the temperature of the main chip of the current user equipment. The status parameters of the current user equipment is provided in order to allow the base station to better understand the current status of the user equipment so as to determine the urgency of the temporary performance changing request and use the status parameters as a reference when adjusting the operation mode configured for the user equipment configuration in response to the temporary performance changing request. The

adjustment suggestion parameter(s) for the base station to configure the operation mode can be various operation parameters suitable for the base station to adopt so as to suggest the base station to adjust the operation mode configured by itself, which are based on the performance issues of the user equipment itself and the current status. For example, stopping the use of LTE network technology in an unlicensed frequency band, suggesting the base station to reduce the number of carriers for carrier aggregation, or reducing the number of the transmit antennas or the carrier antennas when MIMO (Multiple-Input Multiple-Output) is adopted, changing the modulation mode, or other operation parameters which are currently suitable for adoption. The effective time of the temporary performance changing request is determined based on a determination of the user equipment for the duration of the performance issue.

[0027] In this embodiment, the temporary performance changing request is carried by a radio resource control (RRC) message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio (NR) base station, and in other embodiments, it may be a long term evolution (LTE) base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0028] In another specific implementation scenario, different priorities can be configured in advance to the type of the performance issue. The higher the priority, the higher the severity of the performance issue. After the base station receives the temporary performance changing request, the urgency of adjusting the operation mode configured for the user equipment can be determined according to the priority

(of the type) of the performance issue, and the priority can also be a basis for determining whether completely or partially referring to the adjustment suggestion parameter(s) for the base station to configure the operation mode which is proposed in the temporary performance changing request.

[0029] In another specific implementation scenario, the types of performance issues can be more than one, for example, the user equipment emerges the issues of over-heat and RF coexistence at the same time. When the user equipment transmits the temporary performance changing request, the types of the two performance issues are listed at the same time in the types of performance issue. Furthermore, different priorities can be configured in advance to the type of the performance issue, two different types have different priorities, and the base station will perform corresponding adjustments to the operation mode configured for the user equipment according to the priority of the two performance issues after receiving the temporary performance changing request.

[0030] In another specific implementation scenario, different priorities can also be configured in advance to the triggering cause of the performance issue. The higher the priority, the higher the severity of the performance issue. After the base station receives the temporary performance changing request, the urgency of adjusting the operation mode configured for the user equipment can be determined according to the priority of the triggering cause of the performance issue, and the priority can also be a basis for determining whether completely or partially referring to the adjustment suggestion parameter(s) for the base station to configure the operation mode which is proposed in the temporary performance changing request.

[0031] In another specific implementation scenario, the triggering cause of the performance issue further includes an estimated continuing duration of an event triggering the performance issue. The estimated continuing duration includes

temporary, long term, or permanent. After the base station receives the temporary performance changing request, the length of the estimated continuing duration in the triggering cause of the performance can be taken as a basis for adjusting the resources allocated to the user equipment.

[0032] As can be seen from the above-mentioned description, in this embodiment, the user equipment requests the base station to adjust the operation mode configured for the user equipment when the user equipment emerges a performance issue, so that the base station configures a more suitable operation mode for the user equipment itself, which improves the efficiency of resource utilization and reduces the unnecessary resource waste.

[0033] Referring to FIG.2, a flow chart of a second embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0034] At S201: transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request.

[0035] Step S201 is basically the same as step S101 in the first embodiment of the present disclosure, except that in this embodiment, the temporary performance changing request includes at least one of the type of the performance issue, the triggering cause of the performance issue, the status parameter(s) of the current user equipment, and the adjustment suggestion parameter(s) for the base station to configure the operation mode, but not includes the effective time of the temporary performance changing request. The rest is the same as S101 in the first embodiment, and will not be described herein.

[0036] At S202: transmitting a change releasing request to a base station through a user equipment when the performance issue is improved or disappears, where the change releasing request is for requesting the base station to at least partially restore the operation mode configured for the user equipment.

[0037] In a specific embodiment, after the base station has adjusted the configured operation mode, the user equipment uses resources in a more suitable manner. Upon resolving the performance issue, the user equipment transmits a change releasing request to the base station, so as to request the base station to at least partially restore the operation mode configured for the user equipment. For example, if the user equipment has the issue of over-heat, the base station is requested to reduce the number of carriers in a carrier aggregation. The base station reduces the number of the carriers in the carrier aggregation after receiving the temporary performance changing request. After operating for a period of time, the temperature of the user equipment is reduced to be within a preset safety range, the issue of over-heat is resolved, and the user equipment can deal with the number of carriers included in the original carrier aggregation. Hence the user equipment transmits the change releasing request to the base station, so as to request the base station to restore the original resource allocation, that is, to restore the original number of the carriers.

[0038] In another specific implementation scenario, the change releasing request includes the type of the performance issue. Because the user equipment may encounter multiple performance issues at the same time, it is possible that the previous temporary performance changing request includes multiple types of performance issues, and the base station also adjusts the resource allocation correspondingly for these different types of performance issues. After the base station has adjusted the operation mode configured for the user equipment, only one type of the performance issues has been improved or resolved presently. For

example, as to the issue of over-heat, after the base station reduces the number of the carriers in the carrier aggregation, the temperature of the user equipment will not be reduced to be within a preset safety range immediately. But when dealing with an RF coexistence issue, the issue may be resolved immediately after the interference signal is stopped. Hence, it is possible that the RF coexistence issue has been resolved while the temperature of the user equipment has not been reduced to the safety range, hence the change releasing request issued by the user equipment to the base station includes the type of the performance issue, so that the user equipment does not completely restore the operation mode configured for the user equipment when the base station receives the change releasing request, and merely restores part of the operation mode configured for the user equipment corresponding to the type of the performance issue in the change releasing request.

[0039] In this embodiment, the temporary performance changing request is carried by a radio resource control (RRC) message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio (NR) base station, and in other embodiments, it may be a long term evolution (LTE) base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0040] As can be seen from the above-mentioned description, this embodiment can request the base station to relieve the change after the performance issue is resolved or improved, and the original operation mode can be restored in time, thereby saving time effectively, enhancing the operation efficiency, and improving the resource

utilization rate.

[0041] Referring to FIG.3, a flow chart of a third embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0042] At S301: transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, where the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request.

[0043] The basic contents of step S301 are basically the same as those in step S101 of the first embodiment provided by the present disclosure, and will not be described herein. In other embodiments, the basic content of step S301 may also be similar to step S201 in the second embodiment provided by the present disclosure, and the step further includes: the user equipment transmits a change releasing request to the base station, where the change releasing request is for requesting the base station to at least partially restore the operation mode configured for the user equipment while the performance issue is improved or disappears, which is substantially similar to step S202 in the second embodiment of the present disclosure, and will not be described herein, too.

[0044] At S302: receiving and analyzing a change rejecting notification transmitted by the base station.

[0045] In a specific implementation scenario, the base station transmits the change rejecting notification to the user equipment. After receiving the change rejecting notification, the user equipment understands that the base station will not adjust the configured operation mode, and it can choose to retransmit a new temporary performance changing request to request the base station to adjust the configured

operation mode after updating the current status parameter(s), or be no longer transmitting the temporary performance changing request to the base station.

[0046] In another implementation scenario, the change rejecting notification transmitted through the base station includes at least one of the type of the performance issue, a change rejecting reason, and a prohibition duration. Since the user terminal may encounter multiple types of performance issues at the same time or in succession, the base station indicates the type of performance issue which is rejected in the transmitted change rejecting notification and describes the specific reason for rejecting the change in the change rejecting reason. Upon receiving the change rejecting notification, the user equipment will be no longer transmitting the temporary performance changing request for the same type of performance issue. The prohibition duration is a duration for prohibiting the user equipment from repeatedly transmitting the temporary performance changing request of the same type. Within the prohibition duration, the same type of the temporary performance changing request transmitted by the user equipment will be rejected by the base station. Without the prohibition duration, the base station will determine whether to reject the received temporary performance changing request or adjust the operation mode configured for the user equipment with reference to it (i. e., the received temporary performance changing request) according to its contents.

[0047] In this embodiment, the temporary performance changing request is carried by a radio resource control (RRC) message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio (NR) base station, and in other embodiments, it may be a long term evolution (LTE) base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue

when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0048] As described above, in this embodiment, the change rejecting notification transmitted through the base station is capable of saving unnecessary changes, and the temporary performance changing request of the same type will not be transmitted for a period of time, which effectively saves resources and improves the efficiency of operation.

[0049] Referring to FIG.4, a flow chart of a fourth embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0050] At S401: receiving and analyzing a temporary performance changing request transmitted by a user equipment.

[0051] In a specific implementation scenario, the user equipment can bring the performance into full capability when it operates normally. But in the process of actual use, performance issues may be temporarily encountered due to the hardware or system limitations. Hence, the user equipment needs to adjust the current operation mode so that the adjusted operation mode can be more adapted to the current performance of the user equipment. However, the user equipment itself cannot complete these adjustments independently, and needs the assistance of the base station. After the base station has adjusted the operation mode configured for the user equipment, the user equipment will be more matching the operation mode currently configured, thereby achieving the purpose of reducing the waste of resources.

[0052] The temporary performance changing request includes at least one of the type of the performance issue, the triggering cause of the performance issue, the status

parameter(s) of the current user equipment, the adjustment suggestion parameter(s) for the base station to configure the operation mode, and the effective time of the temporary performance changing request. Where, the type of the performance issues can be hardware sharing issues, interference issues, or other user equipment anomalies (e. g. , the issue of over-heat). The triggering cause of the performance issue can be the cause of the user equipment itself, the cause of the exterior, or caused by other events. The status parameters of the current user equipment include various parameters with respect to the current operation status of the user equipment such as the temperature of the current user equipment, the suitable communication method of the current user equipment, the number of antennas used by the current user equipment, the number of carriers used by the current user equipment, and the radio frequency speed of the current user equipment. The status parameters of the current user equipment are provided according to the type of performance issues. For example, when the type of performance issue is over-heat, the status parameters of the current user equipment include the temperature of the main chip of the current user equipment. The status parameters of the current user equipment is provided in order to allow the base station to better understand the current status of the user equipment so as to determine the urgency of the temporary performance changing request and use the status parameters as a reference when adjusting the operation mode configured for the user equipment configuration in response to the temporary performance changing request. The adjustment suggestion parameter(s) for the base station to configure the operation mode can be various operation parameters suitable for the base station to adopt so as to suggest the base station to adjust the operation mode configured for the user equipment, which are based on the performance issues of the user equipment itself and the current status. For example, stopping the use of LTE network technology in an unlicensed frequency

band, suggesting the base station to reduce the number of carriers for carrier aggregation, or reducing the number of the transmit antennas or the carrier antennas when MIMO (Multiple-Input Multiple-Output) is adopted, changing the modulation mode, or other operation parameters which are currently suitable for adoption. The effective time of the temporary performance changing request is determined based on a determination of the user equipment for the duration of the performance issue.

[0053] In this embodiment, the temporary performance changing request is carried by a radio resource control protocol message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio base station, and in other embodiments, it may be a long term evolution base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0054] In another specific implementation scenario, different priorities can be configured in advance to the type of the performance issue. The higher the priority, the higher the severity of the performance issue.

[0055] In another specific implementation scenario, the types of performance issues can be more than one, for example, the user equipment emerges the issues of over-heat and signal interference between internal apparatuses at the same time. When the user equipment transmits the temporary performance changing request, the types of the two performance issues are listed at the same time in the types of the performance issues. Furthermore, different priorities can be configured in advance to the type of the performance issue, two different types have different priorities.

[0056] In another specific implementation scenario, different priorities can also be configured in advance to the triggering cause of the performance issue. The higher the priority, the higher the severity of the performance issue.

[0057] In another specific implementation scenario, the triggering cause of the performance issue further includes an estimated continuing duration of an event triggering the performance issue. The estimated continuing duration includes temporary, long term, or permanent.

[0058] At S402: adjusting an operation mode configured for the user equipment based on the content of the temporary performance changing request.

[0059] In a specific implementation scenario, after receiving the temporary performance changing request, the base station adjusts the operation mode configured for the user equipment according to the type of the performance issue, the triggering cause of the performance issue, and the status parameter of the current user equipment and refer to the adjustment suggestion parameter(s) for the base station to configure the operation mode can. For example, reducing the number of carriers in a carrier aggregation, or reducing the number of the transmit antennas or the carrier antennas when MIMO (Multiple-Input Multiple-Output) is adopted. At the same time, the base station reads the effective time included in the temporary performance changing request and starts timing according to the effective time while performing corresponding adjustments to the operation mode configured for the user equipment according to the temporary performance changing request. When the timing ends, the base station may restore the operation mode configured for the user equipment partially or completely.

[0060] In another specific implementation scenario, different priorities can be configured in advance to the type of the performance issue. After the base station receives the temporary performance changing request, the urgency of adjusting the

operation mode configured for the user equipment can be determined according to the priority (of the type) of the performance issue, and the priority can also be a basis for determining whether completely or partially referring to the adjustment suggestion parameter(s) for the base station to configure the operation mode which is proposed in the temporary performance changing request.

[0061] In another specific implementation scenario, the types of performance issues can be more than one. After receiving the temporary performance changing request, the base station adjusts the operation mode configured for the user equipment according to the priority of multiple performance issues.

[0062] In another specific implementation scenario, different priorities can also be configured in advance to the triggering cause of the performance issue. After the base station receives the temporary performance changing request, the urgency of adjusting the operation mode configured for the user equipment can be determined according to the priority of the triggering cause of the performance issue, and the priority can also be a basis for determining whether completely or partially referring to the adjustment suggestion parameter(s) for the base station to configure the operation mode which is proposed in the temporary performance changing request.

[0063] In another specific implementation scenario, the triggering cause of the performance issue further includes an estimated continuing duration of an event triggering the performance issue. After the base station receives the temporary performance changing request, the length of the estimated continuing duration in the triggering cause of the performance can be taken as a basis for adjusting the resources allocated to the user equipment.

[0064] In this embodiment, the temporary performance changing request is carried by a radio resource control protocol message, and the base station and the user equipment are connected through a new radio network. In other embodiments, it is

also possible to connect through a long term evolution network or other wireless remote networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0065] As can be seen from the above-mentioned description, this embodiment adjusts the operation mode configured for the user equipment in response to the temporary performance changing request proposed by the user equipment, so that the user equipment is more matched with the configured operation mode, and the unnecessary resource waste can be reduced.

[0066] Referring to FIG.5, a flow chart of a fifth embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0067] At S501: receiving and analyzing a temporary performance changing request transmitted by a user equipment.

[0068] At S502: adjusting an operation mode configured for the user equipment based on the content of the temporary performance changing request.

[0069] In this embodiment, steps S501 and S502 are basically similar to S401 and S402 in the fourth embodiment of the present disclosure, except that in this embodiment, the temporary performance changing request includes at least one of a type of the performance issue, the triggering cause of the performance issue, the status parameter(s) of the current user equipment, and the adjustment suggestion parameter(s) for the base station to configure the operation mode, but not includes the effective time of the temporary performance changing request. The rest are similar and will not be described herein.

[0070] At S503: receiving and analyzing a change releasing request transmitted by a

user equipment through the base station.

[0071] In a specific embodiment, after the base station has adjusted the configured operation mode, the performance issue will be improved or disappears. At this point, the user equipment will transmit a change releasing request to the base station, so as to request the base station to at least partially restore to the operation mode configured for the user equipment. The base station receives the change releasing request and analyzes the content of the change releasing request.

[0072] For example, the user equipment emerges the issue of over-heat, and transmits the temporary performance changing request to the base station. The base station reduces the number of the carriers in the carrier aggregation according to the content of the temporary performance changing request upon receiving the temporary performance changing request. After operating for a period of time, the issue of over-heat is resolved, and the user equipment can restore to the original number of the carriers in the carrier aggregation and perform operations. Hence the user equipment transmits the change releasing request to the base station, and the base station receives and analyzes the content of the change releasing request to understand that the number of the carriers in the carrier aggregation can be restored.

[0073] In another specific implementation scenario, the change releasing request includes the type of the performance issue. Because the user equipment may encounter multiple performance issues at the same time, it is possible that the previous temporary performance changing request includes multiple types of performance issue, and the base station also adjusts the resource allocation correspondingly for these different types of performance issues. After the base station has adjusted the operation mode configured for the user equipment, only one type of performance issue has been improved or resolved presently. For example, as to the issue of over-heat, after the base station reduces the number of the carriers in

the carrier aggregation, the temperature of the user equipment will not be reduced to be within a preset safety range immediately. But when an interference issue happens, the issue can be resolved immediately after one of the networks has been stopped. Hence, it is possible that the interference issue has been resolved while the temperature of the user equipment has not been reduced to the safety range, hence the change releasing request issued by the user equipment to the base station includes the type of the performance issue.

[0074] At S504: at least partially restoring the operation mode configured for the user equipment based on the change releasing request through the base station.

[0075] In a specific implementation scenario, the base station analyzes the content of the change releasing request, and at least partially restores the operation mode configured for the user equipment. For example, the base station reduces the number of the carriers in the carrier aggregation in response to the temporary performance changing request due to the over-heat of the user equipment. After receiving the change releasing request transmitted by the user equipment, the change releasing request for the base station is analyzed that the issue of the over-heat has been resolved, and the number of the carriers in the carrier aggregation can be restored.

[0076] In another specific implementation scenario, the change releasing request includes the type of performance issue. When the base station receives the change releasing request, the configured operation mode corresponding to the type of the performance issue in the change releasing request is restored.

[0077] In this embodiment, the temporary performance changing request is carried by a radio resource control protocol message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio base station, and in other embodiments, it

may be a long term evolution base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0078] As described above, this embodiment restores at least part of the operation mode configured for the user equipment in response to the change releasing request transmitted by the user equipment, which can restore to the original operation status in time to save time effectively and enhance the operation efficiency.

[0079] Referring to FIG.6, a flow chart of a sixth embodiment of a communication method of the present disclosure is depicted. The method may include the following blocks.

[0080] At S601: receiving and analyzing a temporary performance changing request transmitted by a user equipment.

[0081] At S602: adjusting an operation mode configured for the user equipment based on the content of the temporary performance changing request.

[0082] Steps S601 and S602 are similar to steps S401 and S402 in the fourth embodiment of the present disclosure, and will not be described herein. In other implementation scenarios, steps S601 and S602 may also be similar to steps S501 and S502 in the fifth embodiment of the present disclosure, and this embodiment further includes the steps: receiving and analyzing the change releasing request transmitted by the user equipment through the base station; and restoring at least part of the operation mode configured for the user equipment according to the change releasing request through the base station, which are similar to steps S503 and S504 in the fifth embodiment of the present disclosure, and will not be described herein.

[0083] At S603: transmitting a change rejecting notification to the user equipment

through the base station.

[0084] In a specific implementation scenario, the base station rejects the temporary performance changing request transmitted by the user equipment. The base station determines that the user equipment is not necessary to perform the performance change according to the type of the performance issue, the triggering cause of the performance issue, and the status parameter(s) of the current user equipment in the temporary performance changing request, and therefore reject to adjust the operation mode configured for the user equipment. In this case, the base station transmits the change rejecting notification to the user equipment. After receiving the change rejecting notification, the user equipment understands that the base station will not adjust the configured operation mode, and can select to update the current status parameter and retransmit a new temporary performance changing request to request the base station to adjust the configured operation mode, or be no longer transmitting the temporary performance changing request to the base station.

[0085] In another implementation scenario, the change rejecting notification transmitted through the base station includes at least one of the type of the performance issue, a change rejecting reason, and a prohibition duration. Since the user terminal may encounter multiple types of performance issues at the same time or in succession, the base station indicates the type of performance issue which is rejected in the transmitted change rejecting notification and describes the specific reason for rejecting the change in the change rejecting reason. Upon receiving the change rejecting notification, the user equipment will be no longer transmitting the temporary performance changing request for the same type of performance issue. The prohibition duration is a duration for prohibiting the user equipment from repeatedly transmitting the temporary performance changing request of the same type. Within the prohibition duration, the same type of the temporary performance

changing requests transmitted by the user equipment will be rejected by the base station. Without the prohibition duration, the base station will determine whether to reject the received temporary performance changing request or adjust the operation mode configured for the user equipment with reference to it (i. e. , the received temporary performance changing request) according to its contents.

[0086] In this embodiment, the temporary performance changing request is carried by a radio resource control protocol message, and in other embodiments, the temporary performance changing request may be transmitted through a message of other protocol such as a MAC (medium access control) message. In this embodiment, the base station is a new radio base station, and in other embodiments, it may be a long term evolution base station or a base station supporting other communication networks. In this embodiment, the user equipment emerges the performance issue when the performance is brought into full capability, and in other embodiments, the user equipment may emerge the performance issue when only partial of the performance is used.

[0087] As described above, in this embodiment, the base station can reduce the unnecessary performance change by determining the temporary performance changing request of the user equipment which can be rejected, thereby saving time and improving the operation efficiency.

[0088] Referring to FIGs. 7, 8, and 9. FIG. 7 is a schematic diagram of the structure of a user equipment according to an embodiment of the present disclosure. FIG. 8 is a schematic diagram of the structure of a base station according to an embodiment of the present disclosure. FIG. 9 is a flow chart of a seventh embodiment of a communication method of the present disclosure. The user equipment 10 includes a first processing circuit 11 and a first communication circuit 12 electrically coupled to each other, the first processing circuit executing instructions in operation to

implement the method of any of claims 1-12. The base station 20 includes a second processing circuit 21 and a second communication circuit 22 electrically coupled to each other. The first communication circuit 12 and the second communication circuit 22 communicate with each other.

[0089] The first processing circuit 11 of the user equipment determines a performance issue emerges on the user equipment 10 and transmits a temporary performance changing request to the base station 20 through the first communication circuit 12. The base station 20 receives the temporary performance changing request through the second communication circuit 22. The second processing circuit 21 analyzes the temporary performance changing request, and adjusts the resources allocated to the user equipment 10 according to the result of the analysis.

[0090] In other embodiments, after the first processing circuit 11 of the user equipment determines that the performance issue of the user equipment 10 has been improved or resolved, a change releasing request is transmitted to the base station 20 through the first communication circuit 12. The base station 20 receives the change releasing request through the second communication circuit 22, and the second processing circuit 21 analyzes the change releasing request, and restores at least part of the operation mode configured for the user equipment according to the analyzed content.

[0091] In other embodiments, as shown in FIG.10, the second processing circuit 21 of the base station 20 determines that the user equipment 10 is not necessary to perform the performance change according to the content of the temporary performance changing request, and therefore transmits the change rejecting notification through the second communication circuit 22.

[0092] As can be seen from the above-mentioned description, in this embodiment, the first processing circuit of the user equipment controls the first communication

circuit to transmit the temporary performance changing request to the base station when the performance issue emerges. The base station controls the second communication circuit 22 to receive the temporary performance changing request through the second processing circuit 21, so as to adjust the operation mode configured for the user equipment so that the user equipment more matching the configured operation mode after adjustment, thereby avoiding the unnecessary resource waste.

[0093] Referring to FIG.11, a schematic diagram of the structure of a device 30 with storage function according to an embodiment of the present disclosure is depicted. The device 30 with storage function is stored with at least one program or instructions 31, and the program or instructions 31 are configured to execute the communication method as shown in FIGs 1-6. In one embodiment, the device 30 with storage function may be a memory chip or a hard disk in a terminal, or be other readable, writeable and storable tool such as a removable hard disk, a USB flash drive, an optical disk, or be a server or the like.

[0094] As can be seen from the above-mentioned description, in this embodiment, the program or instructions 31 stored in the device 30 with storage function can be utilized to request the base station to adjust the operation mode configured for the user equipment, so as to achieve the adjustment of the operation status of the user equipment, so that the user equipment more matching the configured operation mode after adjustment, thereby reducing the resource waste.

[0095] Different from the prior art, the present disclosure requests the base station to adjust the operation mode configured for the user equipment when the user equipment emerges the performance issue, and the adjusted resources are more adaptable to the current performance of the user equipment, thereby improving the matching between the operation mode configured by the base station and the current

performance of the user equipment so as to reduce the resource waste.

[0096] The foregoing are merely embodiments of the present disclosure, and is not intended to limit the scope of the present disclosure. Any equivalent structure or flow transformation made based on the specification and the accompanying drawings of the present disclosure, or any direct or indirect applications of the disclosure on other related fields, shall all be covered within the protection of the present disclosure.

What is claimed is:

1. A communication method, comprising:

Transmitting a temporary performance changing request to a base station through a user equipment when a performance issue emerges, wherein the temporary performance changing request is for requesting the base station to adjust an operation mode configured for the user equipment in response to the temporary performance changing request.

2. The method of claim 1, further comprising:

transmitting a change releasing request to a base station through a user equipment when the performance issue is improved or disappears, wherein the change releasing request is for requesting the base station to at least partially restore the operation mode configured for the user equipment.

3. The method of claim 2, wherein:

the change releasing request comprises the type of the performance issue.

4. The method of claim 1, further comprising:

receiving and analyzing a change rejecting notification transmitted by the base station.

5. The method of claim 4, wherein:

the change rejecting notification comprises at least one of the type of the performance issue, a change rejecting reason, and a prohibition duration, wherein the duration is a duration for prohibiting the user equipment from repeatedly transmitting the temporary performance changing request of the same type.

6. The method of any of claims 1 to 5, wherein:

the temporary performance changing request comprises at least one of the type of the performance issue, a triggering cause of the performance issue, one or more status parameters, one or more adjustment suggestion parameters, and an effective time;

wherein the one or more status parameter comprise the operation status of the user equipment;

wherein the one or more adjustment suggestion parameter comprise operation parameters proposed by the user equipment and are suitable for the base station.

7. The method of claim 6, wherein:

the triggering cause further comprises an estimated continuing duration of an event triggering the performance issue.

8. The method of claim 7, wherein:

the estimated continuing duration comprises temporary, long term, or permanent.

9. The method of claim 6, wherein:

the number of the types of the performance issues is greater than or equal to one.

10. The method of claim 1, wherein:

the base station is a new radio (NR) base station.

11. A method of claim 1, wherein:

the temporary performance changing request is carried by a radio resource control protocol message.

12. A communication method, comprising:

receiving and analyzing a temporary performance changing request transmitted by a user equipment through a base station; and

adjusting an operation mode configured for the user equipment in response to the temporary performance changing request or rejecting the temporary performance changing request through the base station.

13. The method of claim 12, further comprising the following steps after the adjusting an operation mode configured for the user equipment in response to the temporary performance changing request through the base station:

receiving and analyzing a change releasing request transmitted by a user equipment through the base station; and

at least partially restoring the operation mode configured for the user equipment in response to the change releasing request through the base station.

14. The method of claim 13, wherein:

the change releasing request comprises the type of the performance issue.

15. The method of claim 12, further comprising the following steps after the rejecting the temporary performance changing request,

transmitting a change rejecting notification to the user equipment through the base station.

16. The method of claim 15, wherein:

the change rejecting notification comprises at least one of the type of the performance issue, a change rejecting reason, and a prohibition duration, wherein the prohibiting time is a duration for prohibiting the user equipment from repeatedly transmitting the temporary performance changing request of the same type.

17. The method of any of claims 12-16, wherein:

the temporary performance changing request comprises at least one of the type of the performance issue, a triggering cause of the performance issue, one or more status parameters, one or more adjustment suggestion parameters, and an effective time;

restoring the previous operation mode configured for the user equipment through the base station after the effective time expires.

18. The method of claim 17, wherein:

the triggering cause further comprises an estimated continuing duration of an event triggering the performance issue.

19. The method of claim 18, wherein:

the estimated continuing duration comprises temporary, long term, or permanent.

20. The method of claim 17, wherein:

the number of the types of the performance issues is greater than or equal to one.

21. The method of claim 11, wherein:

the base station and the user equipment are connected through a new radio (NR) network.

22. The method of claim 11, wherein:

the temporary performance changing request is carried by a radio resource control protocol message.

23. A user equipment, comprising a first processing circuit and a first communication circuit electrically coupled to each other, the first processing circuit executing instructions in operation to implement the method of any of claims 1-12.

24. A base station, comprising a second processing circuit and a second communication circuit electrically coupled to each other, the second processing circuit executing instructions in operation to implement the method of any of claims 10-18.

25. A device with storage function, wherein the device is stored with instructions, and the instructions implement the method of any of claims 1-10 and 11-20 while executed.

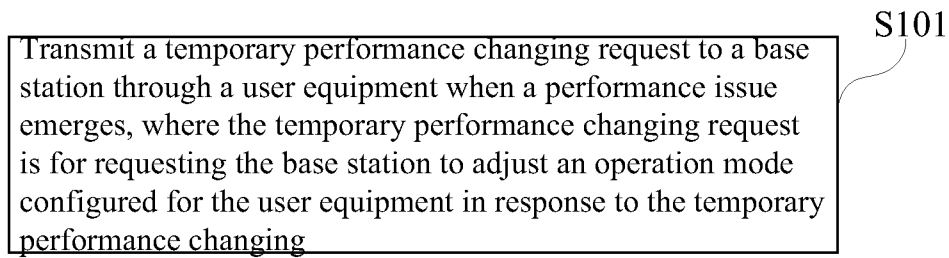


FIG. 1

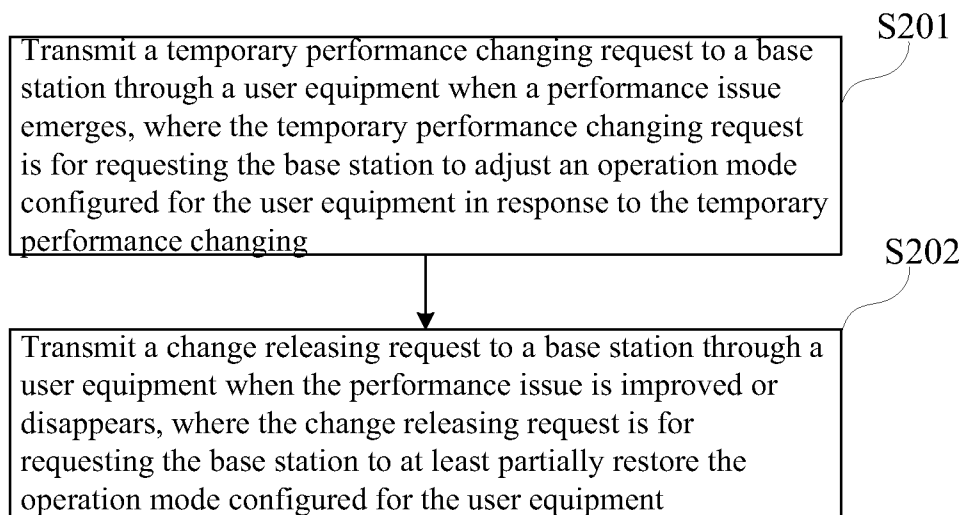


FIG. 2

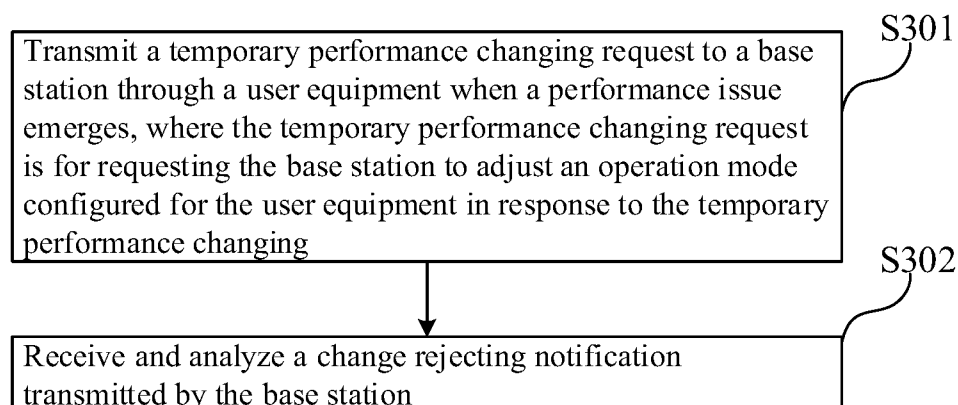


FIG. 3

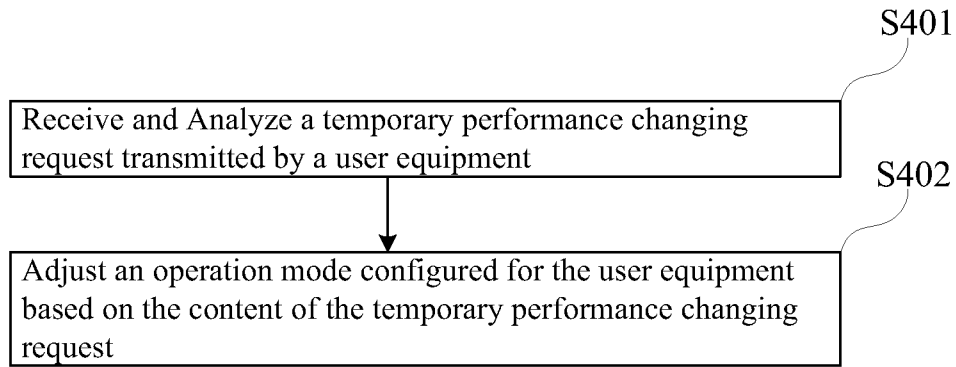


FIG. 4

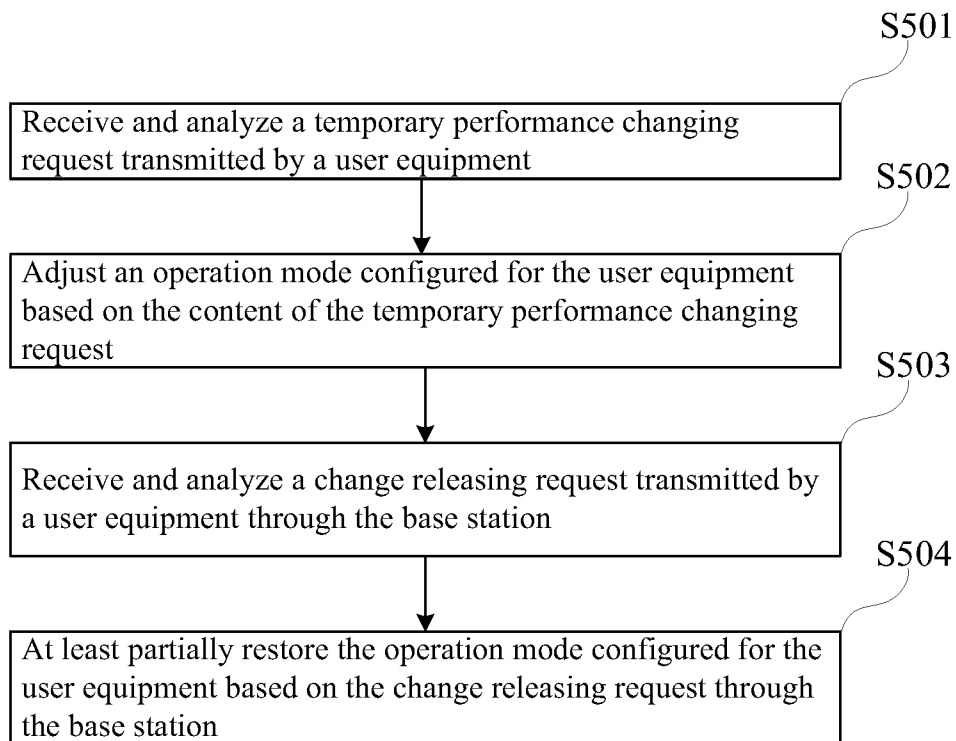


FIG. 5

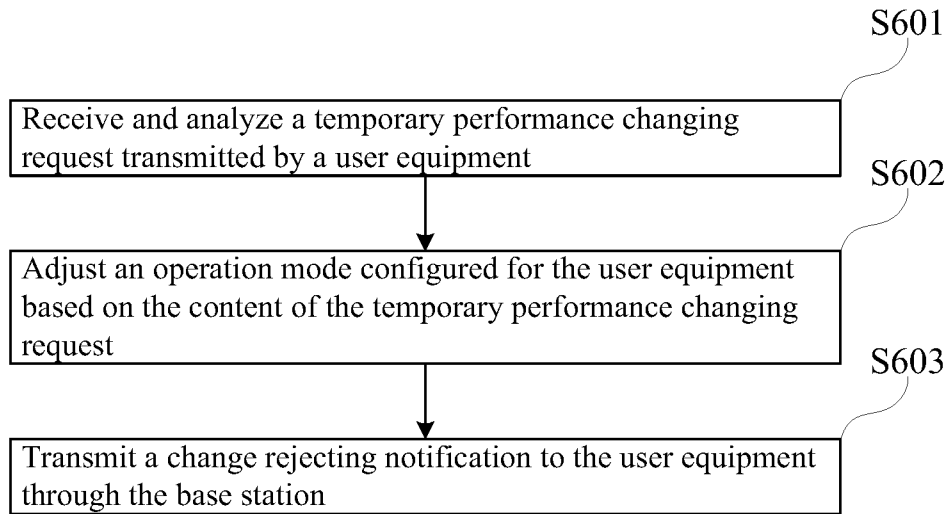


FIG. 6

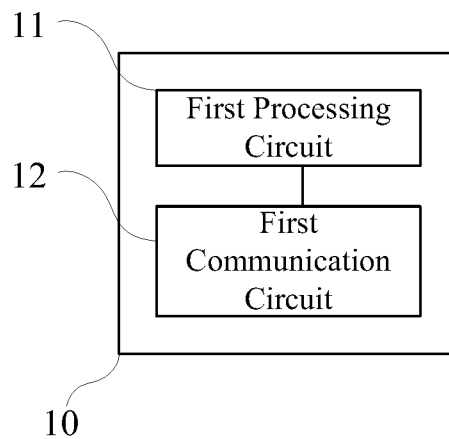


FIG. 7

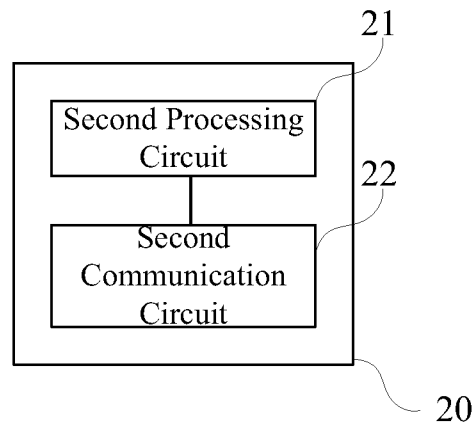


FIG. 8

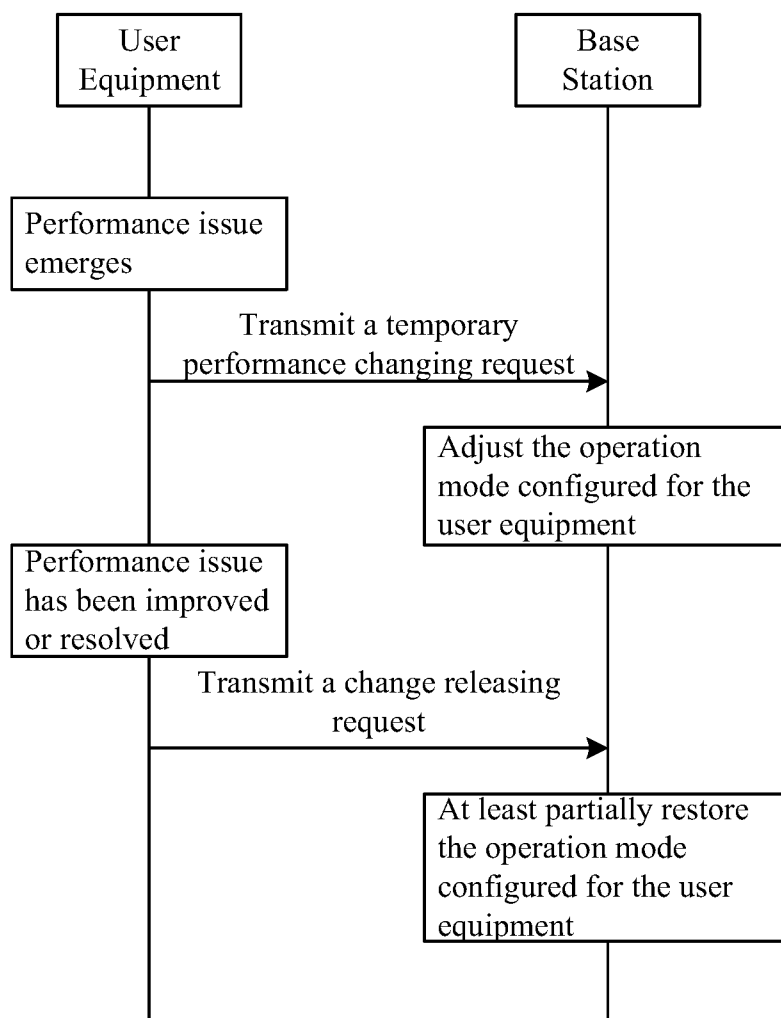


FIG. 9

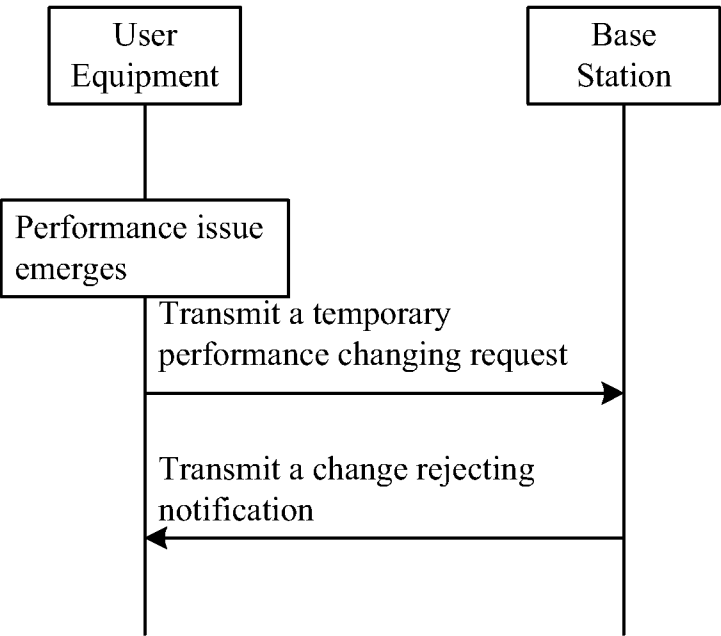


FIG. 10

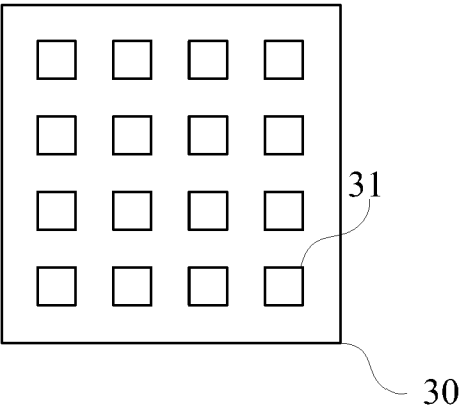


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/108012

A. CLASSIFICATION OF SUBJECT MATTER

H04W 24/02(2009.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W; H04L

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

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

CPRSABS,CNKI,CNTXT,WOTXT,USTXT,EPTXT,VEN,3GPP:adjust, config+, change, request, temporary performance changing request, temperature, parameter, interfere+, base station

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101034926 A (UNIV BEIJING POST & TELECOM) 12 September 2007 (2007-09-12) description, page 7 line 21- page 8 line 4 and figure 8	1-25
A	CN 103188797 A (BEIJING SAMSUNG TELECOM TECHNOLOGY CO LTD., ET AL.) 03 July 2013 (2013-07-03) the whole document	1-25
A	CN 102202330 A (UNIV BEIJING POST & TELECOM) 28 September 2011 (2011-09-28) the whole document	1-25
A	EP 1662395 A2 (FUJITSU LTD) 31 May 2006 (2006-05-31) the whole document	1-25

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

“&” document member of the same patent family

Date of the actual completion of the international search

12 March 2018

Date of mailing of the international search report

04 April 2018

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/108012

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	101034926	A	12 September 2007	CN	101034926	B	22 September 2010
CN	103188797	A	03 July 2013	EP	2798756	A4	26 August 2015
				US	9450717	B2	20 September 2016
				WO	2013100581	A1	04 July 2013
				US	2014369221	A1	18 December 2014
				EP	2798756	A1	05 November 2014
				EP	2798756	B1	07 December 2016
CN	102202330	A	28 September 2011	CN	102202330	B	16 July 2014
EP	1662395	A2	31 May 2006	JP	2006154991	A	15 June 2006
				US	2006114819	A1	01 June 2006