RESOURCE ALLOCATION METHOD AND APPARATUS

TECHNICAL FIELD

[0001] This application relates to the field of wireless communication technologies, and in particular, to a resource allocation method and an apparatus.

BACKGROUND

[0002] In comparison with terrestrial communication, non-terrestrial network (non-terrestrial network, NTN) communication has features such as large coverage and flexible networking, and can achieve seamless global network coverage. In NTN communication, networking is performed through devices such as uncrewed aerial vehicles, high-altitude platforms, and satellites, to provide services such as data transmission and voice communication for user equipment (user equipment, UE).

[0003] In addition, different from that in terrestrial communication, in the NTN communication, a base station is far away from a terminal, and a round-trip time period is long. When a decoding error occurs at a receive end, a data retransmission delay is long, and consequently, a long transmission delay is generated in an entire system due to a retransmission process. Therefore, to improve transmission reliability and reduce a probability of retransmission, a transport block (transport block, TB)-wise (TB-wise) outer encoding scheme is proposed, that is, outer encoding is performed based on TBs.

[0004] Generally, after TB-wise outer encoding is performed, each TB needs to occupy an equal time-frequency resource for transmission. However, in actual application, a problem that time-frequency resources allocated to a plurality of encoded TBs are not equal occurs. Consequently, normal transmission cannot be performed. For example, after being processed through operations such as modulation, an encoded TB is mapped to a corresponding time-frequency resource. One TB is mapped to a physical downlink shared channel (physical downlink shared channel, PDSCH) or physical uplink shared channel (physical uplink shared channel, PUSCH) resource in one slot. Because a synchronization signal, a reference signal, or the like may occupy a time-frequency resource in a same period, quantities of time-frequency resources that are of the PDSCH or the PUSCH and that are used to carry the TB in each slot are different.

[0005] It can be learned from the foregoing that, for TB-wise outer encoding, how to ensure that transmission resources corresponding to all encoded TBs are equal is one of the problems that

urgently need to be resolved currently.

SUMMARY

[0006] This application provides a resource allocation method and an apparatus. According to the method, transmission resources of all transport blocks TBs after outer encoding can be ensured to be equal, thereby meeting transmission requirements/demands after outer encoding.

[0007] According to a first aspect, an embodiment of this application provides a resource allocation method. The method may be performed by a first communication apparatus, or may be performed by a chip, a chip system, a logic module, or software corresponding to a first communication apparatus. This is not limited herein. The following uses the first communication apparatus as an example. In embodiments of this application, the first communication apparatus may be considered as a transmit end/transmitting apparatus, or may be considered as a receive end/receiving apparatus. For example, in a communication system, the first communication apparatus may be a terminal device, or may be a network device (for example, a base station or a satellite). This is not limited herein. The method may include: A first communication apparatus determines a first transmission resource, where the first transmission resource includes transmission resources respectively corresponding to M transport blocks, at least two of the M transport blocks correspond to transmission resources of unequal sizes, and M is an integer greater than 1; and obtains, based on the first transmission resource, M second transmission resources for transmitting the M transport blocks, where all the second transmission resources are of equal size.

[0008] In this embodiment of this application, the M transport blocks (transport block, TB) may be obtained based on outer encoding. The M transport blocks include at least one information transport block and/or at least one parity transport block. The information transport block is a transport block used to carry an original information bit (or a source bit), and the original information bit (or the source bit) carry actual and valid information or data. The parity transport block is a transport block used to carry a parity bit. The parity transport block may be used to assist in decoding the information transport block. For example, outer encoding may be performed on the information transport block, to obtain the parity transport block. In this embodiment of this application, the decoding processing may include outer decoding and/or channel decoding.

[0009] In the first transmission resource, that at least two of the M transport blocks correspond to transmission resources of unequal sizes may be that the M transport blocks correspond to transmission resources of unequal sizes, or may be that some of the M transport blocks correspond to transmission resources of unequal sizes. This is not limited herein.

[0010] If the first communication apparatus is a transmit end/transmitting apparatus, after

obtaining the M second transmission resources of equal sizes based on the first transmission resource, the first communication apparatus may send the M transport blocks to a receive end/receiving apparatus (for example, the second communication apparatus) based on the M second transmission resources. If the first communication apparatus is a receive end/receiving apparatus, after obtaining the M second transmission resources of equal sizes based on the first transmission resource, the first communication apparatus may receive, based on the M second transmission resources, the M transport blocks sent by a transmit end/transmitting apparatus (for example, a second communication apparatus).

[0011] In this solution of this application, after the first communication apparatus determines the first transmission resource, the first transmission resource includes the transmission resources respectively corresponding to the M transport blocks, and when the at least two of the transport blocks correspond to the transmission resources of unequal sizes, the first communication apparatus may obtain, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks, where the second transmission resources are of equal size. According to the method, the transmission resources for transmitting the transport blocks can be ensured to be of equal size. In an application scenario of outer encoding, because all TBs after outer encoding have equal information bit lengths, the TBs also need to correspond to transmission resources of equal sizes. According to the solutions of this application, transmission resources for transmitting the TBs after outer encoding can be ensured to be of equal size, thereby meeting transmission requirements/demands after outer encoding.

[0012] In a possible implementation, the method further includes: The first communication apparatus receives first information, where the first information indicates information about the first transmission resource, and the information about the first transmission resource includes a size of the first transmission resource.

[0013] In this implementation, the first communication apparatus may be a terminal device, and the first transmission resource is configured or scheduled by the base station for the M transport blocks. In this case, the first communication apparatus may receive the first information from the base station, where the first information indicates the information about the first transmission resource.

[0014] For example, the first information may be carried or borne in downlink control information DCI, a media access control MAC message, or the like.

[0015] In this embodiment of this application, if the first communication apparatus is a base station, the first communication apparatus may configure or schedule the first transmission resource for the M transport blocks, and may indicate or send the information about the first transmission resource to the terminal device.

[0016] In the foregoing description, the information about the first transmission resource includes the size of the first transmission resource, and may further include a type of the first transmission resource, and the like. For example, the first transmission resource is a time domain resource and/or a frequency domain resource, and the first transmission resource is an uplink transmission resource or a downlink transmission resource.

[0017] In this implementation, the first communication apparatus can effectively learn of the size of the first transmission resource, so that proper transmission resources are subsequently allocated to the M transport blocks based on the size of the first transmission resource.

[0018] In a possible implementation, that the first communication apparatus obtains, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks may include: evenly allocating the first transmission resource, to obtain the M second transmission resources.

[0019] In this implementation, transmission resources of a same size can be ensured to be allocated to the M transport blocks after outer encoding, and transmission requirements/demands after outer encoding are met, thereby effectively completing transmission of the M transport blocks subsequently.

[0020] In a possible implementation, the first transmission resource includes transmission resources corresponding to M time units, and the M time units are in a one-to-one correspondence with the M transport blocks. In embodiments of this application, the transmission resource includes a time domain resource, and/or a frequency domain resource. The time unit may be any one of but is not limited to a radio frame, a subframe, a slot, or a symbol.

[0021] In this implementation, in the first transmission resource, a transmission resource corresponding to each time unit is for transmitting one transport block. When transmission resources corresponding to the M time units are not equal, the first communication apparatus can effectively reallocate transmission resources to the M transport blocks based on the first transmission resource.

[0022] In a possible implementation, the first transmission resource includes K time-frequency units, and K is an integer greater than M or equal to M. In this embodiment of this application, the time-frequency unit may be but is not limited to a resource block (resource block, RB), a resource element (resource element, RE), or a resource block group (resource block group, RBG).

[0023] In this implementation, the transmission resources in the first transmission resource are at a granularity of a time-frequency unit. Subsequently, transmission resources of equal sizes can be effectively allocated to the M transport blocks based on a quantity of time-frequency units.

[0024] In a possible implementation, that the first communication apparatus evenly allocates the first transmission resource, to obtain the M second transmission resources includes: evenly

allocating the K time-frequency units, to obtain the M second transmission resources, where all the second transmission resources have equal quantities of time-frequency units.

[0025] In this implementation, the first communication apparatus allocates, based on a total quantity of time-frequency units in the first transmission resource, time-frequency units with an equal quantity to the M transport blocks, thereby effectively implementing that the transmission resources corresponding to the M transport blocks are of equal size.

[0026] In a possible implementation, when a ratio of K to M is a non-integer, that the first communication apparatus evenly allocates the first transmission resource, to obtain the M second transmission resources may include: first evenly allocating, based on a target value Q, the K time-frequency units to obtain the M second transmission resources, where each second transmission resource has a quantity of time-frequency units equal to the target value Q, the target value Q is obtained by rounding down the ratio of K to M, and Q is a positive integer.

[0027] In this embodiment of this application, if the K time-frequency units cannot be evenly allocated to the M second transmission resources, the K time-frequency units may be evenly allocated in a manner of rounding down to an integer. To be specific, some time-frequency units are selected from the K time-frequency units and are not used for transmission, so that time-frequency units used for transmission in the K time-frequency units can be evenly allocated to the M second transmission resources.

[0028] In this implementation, the M second transmission resources for transmitting the M transport blocks can be ensured to have equal quantities of time-frequency units.

[0029] In a possible implementation, the first transmission resource further includes N remaining time-frequency units, where N=K–Q*M, N is a positive integer, and "*" is a multiplication sign.

[0030] In this embodiment of this application, positions of the N time-frequency units in the K time-frequency units may be preset, or may be determined by the first communication apparatus, or may be randomly selected. This is not limited herein. In addition, the N time-frequency units may be used for TB transmission in a next round or a next period. This is not limited herein either.

[0031] In this implementation, the time-frequency units that are not for transmitting the M transport blocks may be flexibly selected or set from the K time-frequency units.

[0032] According to a second aspect, this application further provides a communication apparatus. The communication apparatus is a first communication apparatus or a chip in a first communication apparatus. The communication apparatus has a function of implementing any method provided in the first aspect. The communication apparatus may be implemented by hardware, or may be implemented by executing corresponding software by hardware. The hardware or the software includes one or more units or modules corresponding to the foregoing

functions.

[0033] In a possible design, the communication apparatus includes a processor. The processor is configured to support the communication apparatus in performing a corresponding function of the first communication apparatus in the foregoing method. The communication apparatus may further include a memory. The memory may be coupled to the processor, and the memory stores program instructions and data that are necessary for the communication apparatus. Optionally, the communication apparatus further includes an interface circuit. The interface circuit is configured to support communication between the communication apparatus and another communication apparatus, for example, data or signal receiving and sending. For example, the communication interface may be a transceiver, a circuit, a bus, a module, or another type of communication interface.

[0034] In a possible design, the communication apparatus includes corresponding functional modules respectively configured to implement steps in the foregoing methods. The function may be implemented by hardware, or may be implemented by executing corresponding software by hardware. The hardware or software includes one or more modules corresponding to the foregoing functions.

[0035] In a possible design, a structure of the communication apparatus includes a processing unit and a communication unit. The processing unit is configured to determine a first transmission resource, where the first transmission resource includes transmission resources respectively corresponding to M transport blocks, at least two of the M transport blocks correspond to transmission resources of unequal sizes, and M is an integer greater than 1. The communication unit is configured to obtain, based on the first transmission resource, M second transmission resources for transmitting the M transport blocks, where all the second transmission resources are of equal size.

[0036] In a possible design, the communication unit is further configured to receive first information, where the first information indicates information about the first transmission resource, and the information about the first transmission resource includes a size of the first transmission resource.

[0037] In a possible design, when obtaining, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks, the processing unit is specifically configured to evenly allocate the first transmission resource, to obtain the M second transmission resources.

[0038] In a possible design, the first transmission resource includes transmission resources corresponding to M time units, the M time units are in a one-to-one correspondence with the M transport blocks, and the transmission resources include a time domain resource and/or a frequency

domain resource.

[0039] In a possible design, the time unit is any one of the following:

a radio frame, a subframe, a slot, or a symbol.

[0040] In a possible design, the first transmission resource includes K time-frequency units, and K is an integer greater than M or equal to M. In this embodiment of this application, the time-frequency unit may be but is not limited to any one of the following:

a resource block RB, a resource element RE, or a resource block group RBG.

[0041] In a possible design, when evenly allocating the first transmission resource, to obtain the M second transmission resources, the processing unit is specifically configured to: evenly allocate the K time-frequency units, to obtain the M second transmission resources, where all the second transmission resources have equal quantities of time-frequency units.

[0042] In a possible design, if a ratio of K to M is a non-integer, the processing unit is specifically configured to: when evenly allocating the first transmission resource, to obtain the M second transmission resources, evenly allocate, based on a target value Q, the K time-frequency units to obtain the M second transmission resources, where each second transmission resource has a quantity of time-frequency units equal to the target value Q, the target value Q is obtained by rounding down the ratio of K to M, and Q is a positive integer.

[0043] In a possible design, the first transmission resource further includes N remaining time-frequency units, and positions of the N time-frequency units in the K time-frequency units are preset, where N=K–Q*M, and N is a positive integer.

[0044] In a possible design, the M transport blocks are obtained based on outer encoding; and the M transport blocks include at least one information transport block and/or at least one parity transport block, where the information transport block is used to carry an original information bit, and the parity transport block is used to assist in decoding the information transport block.

[0045] According to a third aspect, a communication apparatus is provided, including a processor and an interface circuit. The interface circuit is configured to: receive a signal from a communication apparatus other than the communication apparatus and transmit the signal to the processor, or send a signal from the processor to a communication apparatus other than the communication apparatus. The processor is configured to implement the method according to any one of the first aspect and the possible implementations of the first aspect.

[0046] According to a fourth aspect, a computer-readable storage medium is provided. The computer-readable storage medium stores a computer program or instructions. When the computer program or the instructions are executed by a processor, the method according to any one of the first aspect and the possible implementations of the first aspect is implemented.

[0047] According to a fifth aspect, a computer program product storing instructions is

provided. When the instructions are run by a processor, the method according to any one of the first aspect and the possible implementations of the first aspect is implemented.

[0048] According to a sixth aspect, a chip system is provided. The chip system includes a processor. The processor may be configured to read and execute a program instruction stored in a memory, to implement the method according to any one of the first aspect and the possible implementations of the first aspect. The chip system may further include a memory. The chip system may include a chip, or may include a chip and another discrete component.

[0049] According to a seventh aspect, a communication system is provided. The communication system includes the first communication apparatus according to the first aspect.

[0050] For technical effects that can be achieved by the technical solutions according to any one of the second aspect to the seventh aspect, refer to the descriptions of the technical effects that can be achieved by the technical solutions according to the first aspect. Details are not described herein again.

BRIEF DESCRIPTION OF DRAWINGS

[0051] FIG. 1A is a flowchart of a TB group retransmission solution in a large-delay scenario;

[0052] FIG. 1B is a diagram of retransmitting a TB at a PHY/MAC layer in a large-delay scenario;

[0053] FIG. 2A is a diagram of outer encoding;

[0054] FIG. 2B is a schematic flowchart of outer encoding;

[0055] FIG. 3 is a diagram of time-frequency resources corresponding to two slots;

[0056] FIG. 4A is a diagram of an architecture of a communication system to which an embodiment of this application is applicable;

[0057] FIG. 4B is a diagram of an open radio access network (Open Radio Access Network, ORAN) system to which an embodiment of this application is applicable;

[0058] FIG. 4C is a diagram of an architecture of another communication system to which an embodiment of this application is applicable;

[0059] FIG. 5 is a schematic flowchart of a resource allocation method according to an embodiment of this application;

[0060] FIG. 6A is an example flowchart of an implementation 1 according to an embodiment of this application;

[0061] FIG. 6B is an example diagram of transmission resources configured by a base station for UE according to an embodiment of this application;

[0062] FIG. 6C is an example flowchart of transmission resource reallocation according to an

embodiment of this application;

[0063] FIG. 7A is an example flowchart of an implementation 2 according to an embodiment of this application;

[0064] FIG. 7B(1) and FIG. 7B(2) are another example diagram of transmission resources configured by a base station for UE according to an embodiment of this application;

[0065] FIG. 7C(1) and FIG. 7C(2) are another example flowchart of transmission resource reallocation according to an embodiment of this application;

[0066] FIG. 8A is an example flowchart of an implementation 3 according to an embodiment of this application;

[0067] FIG. 8B is still another example flowchart of transmission resource reallocation according to an embodiment of this application;

[0068] FIG. 9 is a diagram of a communication apparatus according to an embodiment of this application;

[0069] FIG. 10 is a diagram of another communication apparatus according to an embodiment of this application; and

[0070] FIG. 11 is a diagram of an apparatus of a chip to which an embodiment of this application is applicable.

DESCRIPTION OF EMBODIMENTS

[0071] The following clearly and completely describes the technical solutions in embodiments of this application with reference to the accompanying drawings in embodiments of this application. Terms used in the following embodiments are merely intended to describe specific embodiments, but are not intended to limit this application. The terms "one", "a", "the", "the foregoing", and "this" of singular forms used in this specification and the appended claims of this application are also intended to include expressions such as "one or more", unless otherwise specified in the context clearly. It should be further understood that, in embodiments of this application, "one or more" refers to one, two, or more, and "and/or" describes an association relationship between associated objects, and indicates that three relationships may exist. For example, A and/or B may indicate the following cases: Only A exists, both A and B exist, and only B exists, where A and B may be singular or plural. The character "/" generally indicates an "or" relationship between associated objects.

[0072] Reference to "an embodiment", "some embodiments", or the like described in this specification means that one or more embodiments of this application include a specific feature, structure, or characteristic described with reference to the embodiment. The terms "include",

"comprise", "have", and variants thereof in this application all mean "include but are not limited to", unless otherwise specifically emphasized in another manner. The term like "example" or "for example" is used to represent an example, an illustration, or a description. Any embodiment or design scheme described with "example" or "for example" should not be explained as being more preferred or having more advantages than another embodiment or design scheme. Use of the term "example", "for example", or the like is intended to present a related concept in a specific manner for ease of understanding.

[0073] "A plurality of" in embodiments of this application means two or more. It should be noted that, in descriptions of embodiments of this application, terms such as "first" and "second", and numbers such as "1" and "2" (other than a special case of representing a value) are merely used for distinguishing and description, and shall not be understood as indicating or implying relative importance, or shall not be understood as indicating or implying a sequence. In addition, the term "indicating" mentioned in descriptions of embodiments of this application may include directly indicating and indirectly indicating. When a piece of indication information is described as indicating A, the indication information may directly indicate A or indirectly indicate A, but it does not indicate that the indication information definitely carries A.

[0074] To better understand the solutions provided in embodiments of this application, the following first explains terms (words), concepts, and procedures in embodiments of this application. It should be noted that these explanations are intended to make embodiments of this application easier to understand, but should not be considered as limitations on the protection scope claimed in this application.

[0075] 1. NTN

[0076] The NTN is proposed relative to a conventional terrestrial network, and refers to a network established through a non-terrestrial communication technology. NTN communication may include but is not limited to networking through devices such as an uncrewed aerial vehicle, a high-altitude platform, and a satellite, to provide services such as data transmission and voice communication for user equipment (user equipment, UE)/terminal device. The high-altitude platform station device is generally 8 km to 50 km above the ground. According to an orbital altitude of a satellite, a satellite communication system may be classified into three types: a geostationary earth orbit (geostationary earth orbit, GEO) satellite communication system, which is also referred to as a synchronous orbit satellite system; a medium earth orbit (medium earth orbit, MEO) satellite communication system; and a low earth orbit (low earth orbit, LEO) satellite communication system. A GEO satellite has an orbit altitude of 35786 km. A main advantage is that the GEO satellite can remain stationary relative to the ground and provide a large coverage area. However, the GEO satellite has significant disadvantages in communication: (1) A GEO

satellite orbit is far away from the earth, and a free space propagation loss is large, resulting in a tight communication link budget. To increase a transmit/receive gain, the satellite needs to be equipped with an antenna with a large diameter. (2) A communication transmission delay is large, and a round trip time may reach about 500 ms. This cannot meet demands of low-delay services. (3) GEO orbital resources are limited, launch costs are high, and coverage cannot be provided for polar regions of the earth. An orbital height of an MEO satellite ranges from 2000 km to 35786 km. An advantage is that global coverage can be implemented through a smaller quantity of satellites. However, the MEO satellite has a larger orbital height than that of the LEO, and a transmission delay is still higher than that of LEO satellite communication. Based on advantages and disadvantages of the MEO satellite communication, the MEO satellite is mainly used for positioning and navigation. An orbital height of a LEO satellite ranges from 300 km to 2000 km. The LEO satellite has a lower orbital height than that of the MEO and the GEO, and has advantages of low data transmission delay, a small transmission loss, and low transmission costs. Therefore, LEO satellite communication has gained more attention in recent years.

[0077] In comparison with terrestrial communication, non-terrestrial network (non-terrestrial network, NTN) communication has features such as a large coverage region and flexible networking, and can achieve seamless global network coverage. An NTN network is a supplement to a current terrestrial network, and may also be considered as an independent communication system that provides users with global high-speed network access. Currently, research institutes, communication organizations, communication companies, and the like in the world all have participated in researching NTN communication technologies and standard formulation, aiming to build an integrated communication network for space-air-ground communication.

[0078] Currently, a 5G new radio (new radio, NR) technology is evolving from R18 to R19. Meanwhile, the NR technology has evolved from a standardization phase to a commercial deployment phase. An NR standard protocol is researched for wireless communication technologies designed for terrestrial cellular network scenarios, and can provide users with wireless communication services featuring ultra-low latency, ultra-high reliability, ultra-high rates, and ultra-massive connectivity. However, seamless global coverage cannot be achieved via a cellular network. For example, in areas without terrestrial base stations, such as sea areas, polar areas, and rainforests, voice and data services cannot be provided for these areas without cellular network coverage.

[0079] 2. A PHY/MAC layer retransmission mechanism in a large-delay scenario

[0080] In NTN communication, a base station is far away from a terminal, and a round-trip transmission time period is long. When a decoding error occurs at a receive end, a data retransmission delay is long, and consequently, a long transmission delay is generated in an entire

system due to a retransmission process. Therefore, to improve transmission reliability and reduce a probability of retransmission, a transport block (transport block, TB)-wise (TB-wise) outer encoding scheme is proposed, that is, outer encoding is performed based on TBs.

[0081] FIG. 1A is a flowchart of a TB group retransmission solution in a large-delay scenario. As shown in FIG. 1A, a procedure of the TB group retransmission solution includes the following steps.

[0082] S101A: A satellite base station side determines a length of a process window.

[0083] In a possible implementation, the satellite base station may determine the length of the process window based on a satellite orbit height, a position relationship between a satellite and a service area, and the like.

[0084] S102A: The satellite base station configures or sends the length of the process window to a terminal device.

[0085] All TBs transmitted within the length of the process window belong to a same process.

[0086] S103A: The satellite base station sends downlink data, that is, at least one TB, to the terminal device within the process window.

[0087] S104A: The terminal device performs decoding processing on the downlink data (that is, the at least one TB) within the process window.

[0088] S105A: The terminal device feeds back decoding results of the TBs within the process window to the satellite base station.

[0089] For example, the terminal device feeds back, to the satellite base station, a decoding result of each TB transmitted within the process window; or the terminal device feeds back, to the satellite base station, a quantity of TBs that are incorrectly decoded in the TBs transmitted within the process window.

[0090] S106A: The satellite base station sends, to the terminal device within a process window with a same process number, the corresponding data to-be-retransmitted within the process window based on the decoding results of the TBs within the process window that are fed back by the terminal device.

[0091] For example, in S105A, if the terminal device incorrectly decodes m TBs, in S106A, the satellite base station sends m parity TBs corresponding to the process window to the terminal device, or resends the m TBs to the terminal device, where m is a positive integer.

[0092] S107A: The terminal device (UE) performs decoding on the data retransmitted within the process window or performs joint decoding on the retransmitted data together with the previously received TBs.

[0093] If the terminal device receives the m TBs that are resent by the satellite base station, the terminal device performs decoding processing on the m TBs. If the terminal device receives m

parity TBs corresponding to the m TBs that are incorrectly decoded, the terminal device performs joint decoding on the m parity TBs together with the m TBs that are previously received.

[0094] S108A: The terminal device feeds back decoding results of the TBs within the process window to the satellite base station.

[0095] The terminal device sends, to the satellite base station, a decoding result of each TB transmitted within the process window or a quantity of TBs that are incorrectly decoded. Herein, refer to the steps S105A to S107A. Details are not described again.

[0096] FIG. 1B is a diagram of retransmitting a TB at a media access control (media access control, MAC) layer or a physical (physical, PHY) layer in a large-delay scenario. An upper part corresponds to uplink transmission, and a lower part corresponds to downlink transmission. As shown in FIG. 1B, within a process window, TBs sent by the satellite base station to the terminal device form a process or are mapped to a process. The terminal device feeds back decoding results of the TBs received in the process to the satellite base station, and performs retransmission based on the process window.

[0097] The process window in the solution in FIG. 1A may be replaced with a quantity of TBs in a TB group mapped to a process. In other words, "the satellite base station configures, for the terminal device, a quantity of TBs corresponding to one process" is replaced with "the satellite base station configures, for the terminal device, a length of one process window". In the large-delay scenario, this solution can achieve beneficial effects of higher spectral efficiency and a lower transmission delay.

[0098] 3. Outer code (Outer code) method

[0099] Steps performed by a transmit end before sending data include: performing channel encoding, outer encoding, modulation, and the like on the to-be-sent data. After receiving the data, a receive end performs an inverse process of processing performed by the transmit end.

[00100] An encoding method used for outer encoding may include a Reed Solomon code (Reed Solomon code, RS code for short), a fountain code (fountain code), an algebraic code (algebraic code), a Raptor (Raptor code), a minimum distance separable code (minimum distance separable (MDS) code), and the like.

[00101] Outer encoding (outer encoding) is performed on information bits (information bits) at the MAC layer or the physical layer, then bits after outer encoding are used as source information bits, and then LDPC encoding is performed on the source information bits. Finally, LDPC encoded blocks are mapped to different slots and used as a plurality of TBs (transport blocks).

[00102] As shown in FIG. 2A, it is assumed that outer encoding (for example, raptorQ encoding) is separately performed on information bits (information bits) of four TBs at a media access control MAC layer or a physical PHY layer, and information bits (information bits) of two parity TBs

(parity TBs) are added to the original information bits (information bits) of the four TBs. In other words, the two parity TBs are used as parity TBs (parity TBs). Further, LDPC encoding is performed on the information bits (information bits) of the six TBs after outer encoding, to obtain encoded bits of the six TBs. Finally, the six TBs are respectively mapped to six different time domain slots for sending. Compared with only LDPC encoding, encoding shown in FIG. 2A differs in that: outer encoding of source information bits (source info. bits) is additionally performed, and information bits of a plurality of parity TBs (parity TB info. bits) are added.

[00103] The following describes a function of a parity transport block (parity TB).

[00104] It is assumed that a quantity of sent source TBs (source TB) is 30, and a quantity of parity TBs is 5. If the receive end receives any 30 TBs in the 35 TBs, a probability of correctly decoding and restoring original data is (1–0.5%). If 31 TBs in the 35 TBs are received, a probability of correctly restoring the original data is 100%. In actual use of outer code, a quantity of received TBs is slightly greater than a quantity of source TBs (source TBs), to ensure 100% decoding. It can be learned that a function of the parity TB (parity TB) is that the parity TB can be effectively used to assist in decoding, so as to ensure a probability of correct decoding.

[00105] In this embodiment of this application, for ease of description, it may be assumed that a quantity (length) of correctly received encoded TBs is equal to a quantity (length) of source TBs (source TBs), that is, the encoded TBs can be correctly decoded.

[00106] As shown in FIG. 2B, a specific procedure of outer encoding includes the following steps.

[00107] S201B: Equally divide source information bits of a source block (source block) into a plurality of groups of source information bits (information bits, Info. bits for short below), where lengths of the plurality of groups of source information bits (Info. bits) are equal (a requirement of outer encoding).

[00108] For example, as shown in FIG. 2B, the source information bits of the source block (source block) are equally divided into four groups (which may also be referred to as four segments), and each group has equal lengths (or quantities) of the source information bits (Info. bits).

[00109] S202B: Perform outer encoding (outer encoding) on the plurality of groups of source information bits, to obtain a plurality of groups of source bits (source bits) (that is, Info. bits shown in FIG. 2B) and a plurality of groups of parity bits (parity bits) after outer encoding.

[00110] If encoding is performed through system code, the source bits are the same as the Info. bits before outer encoding.

[00111] S203B: Encode, through LDPC channel encoding, the plurality of groups of source bits (source bits) and the plurality of groups of parity bits (parity bits) after outer encoding, to obtain a

plurality of groups of LDPC encoded source bits (LDPC encoded source bits) and a plurality of groups of LDPC encoded parity bits (LDPC encoded parity bits).

[00112] To ensure that a receive end has same or similar decoding performance for the source bits and the parity bits, in S203B, channel encoding is performed on the source bits and the parity bits through a same code rate.

[00113] For example, as shown in FIG. 2B, the four groups of source bits (source bits) and the four groups of parity bits (parity bits) are encoded by using LDPC channel encoding, to obtain four groups of LDPC-encoded source bits (LDPC-encoded source bits) and four groups of LDPC-encoded parity bits (LDPC-encoded parity bits).

[00114] S204B: After operations such as modulation and inverse discrete fourier transform (inverse discrete fourier transform, IDFT) are performed on the plurality of groups of LDPC-encoded source bits (LDPC-encoded source bits) and the plurality of groups of LDPC-encoded parity bits (LDPC-encoded parity bits), map the plurality of groups of LDPC-encoded source bits and the plurality of groups of LDPC-encoded parity bits to corresponding time-frequency resources, so as to perform sending.

[00115] To ensure that the receive end has same or similar decoding performance for the source bits and the parity bits, the LDPC-encoded source bits (LDPC-encoded source bits) and the LDPC encoded parity bits (LDPC-encoded parity bits) are modulated in a same modulation scheme.

[00116] In the foregoing, each group may be collectively referred to as one TB.

[00117] Finally, because each group of Info. bits (TB) and each group of parity bits (parity TB) have a same length, a same channel encoding code rate, and a same modulation scheme, a quantity of time-frequency resources occupied by each encoded TB is also the same. As shown in FIG. 2B, each group of LDPC-encoded source bits and each group of LDPC-encoded parity bits correspond to a same quantity (length) of time-frequency resources.

[00118] In the conventional technology, one TB is mapped to a physical downlink shared channel (physical downlink shared channel, PDSCH)/physical uplink shared channel (physical uplink shared channel, PUSCH) resource in a slot (slot). However, because resources are occupied by a synchronization signal, a reference signal, and the like, quantities of time-frequency resources that are of a PDSCH/PUSCH and that carry the TB in each slot are different (not equal), and it is clear that a demand that a plurality of TBs after outer encoding occupy a same quantity of time-frequency resources cannot be met.

[00119] FIG. 3 is used as an example. In FIG. 3, a left side is time-frequency resources of a slot 0 (slot 0), and an RB 0 and an RB 1 are used as an example. The slot 0 includes physical downlink control channel (physical uplink control channel, PDCCH) data, a demodulation reference signal (demodulation reference signal, DMRS), a channel state information reference signal (channel

state information reference signal, CSI-RS), a phase tracking reference signal (phase tracking reference signal, PTRS), and PDSCH data. A quantity of resource elements (resource element, RE) that finally carry the PDSCH data is 244. A right side in FIG. 3 is time-frequency resources of the slot 1 (slot 1), and an RB 0 and an RB 1 are used as an example. The slot 1 includes a DMRS, a PTRS, and PDSCH data. A quantity of resource elements REs that finally carry the PDSCH data is 300. Therefore, the quantity of time-frequency resources corresponding to the slot 0 is different from the quantity of time-frequency resources corresponding to the slot 1. When the two TBs after outer encoding are mapped to the time-frequency resources corresponding to the slot 0 and the slot 1, it is clear that a demand that the two TBs after outer encoding occupy a same quantity of time-frequency resources is not met.

[00120] To resolve the foregoing problem, an embodiment of this application provides a resource allocation method. In the method, transmission resources of all transport blocks TBs after outer encoding can be ensured to be equal, thereby meeting a transmission requirement after outer encoding.

[00121] The technical solutions in embodiments of this application may be applied to various communication systems, for example, a terrestrial communication system and a non-terrestrial communication system such as a satellite communication system. The satellite communication system may be integrated with a mobile communication system. For example, the mobile communication system may be a 4th generation (4th Generation, 4G) communication system (for example, a long term evolution (long term evolution, LTE) system), a worldwide interoperability for microwave access (worldwide interoperability for microwave access, WiMAX) communication system, a 5th generation (5th Generation, 5G) communication system (for example, a new radio (new radio, NR) system), and a future mobile communication system. Alternatively, the mobile communication system may be a vehicle to everything (vehicle to everything, V2X) system or an internet of things (internet of things, IoT) system.

[00122] FIG. 4A is a diagram of a possible architecture of a communication system to which an embodiment of this application is applicable. As shown in FIG. 4A, the communication system 4000 includes a radio access network (radio access network, RAN) 100 and a core network 200. Optionally, the communication system 4000 may further include an internet 300. The RAN 100 includes at least one RAN node (for example, 110a and 110b in FIG. 4A, collectively referred to as 110), and may further include at least one terminal (for example, 120a to 120j in FIG. 4A, collectively referred to as 120). The RAN 100 may further include another RAN node, for example, a wireless relay device and/or a wireless backhaul device (not shown in FIG. 4A). The terminal 120 is connected to the RAN node 110 in a wireless manner, and the RAN node 110 is connected to the core network 200 in a wireless or wired manner. A core network device in the core network

200 and the RAN node 110 in the RAN 100 may be different independent physical devices, or may be a same physical device that integrates a logical function of the core network device and a logical function of the RAN node. Terminals may be connected to each other in a wired or wireless manner, and RAN nodes may be connected to each other in a wired or wireless manner.

[00123] The RAN 100 may be an evolved universal terrestrial radio access (evolved universal terrestrial radio access, E-UTRA) system, a new radio (new radio, NR) system, or a future radio access system defined in the 3rd generation partnership project (3rd generation partnership project, 3GPP), or may be a Wi-Fi system. The RAN 100 may further include the foregoing two or more different radio access systems. The RAN 100 may alternatively be an open RAN (open RAN, O-RAN).

[00124] A RAN node, also referred to as a radio access network device, a RAN entity, or an access node, is configured to help a terminal access a communication system in a wireless manner. In an application scenario, the RAN node may be a base station (base station), an evolved NodeB (evolved NodeB, eNodeB), a transmission reception point (transmission reception point, TRP), a next generation NodeB (next generation NodeB, gNB) in a 5G mobile communication system, a next generation NodeB in a future mobile communication system, a base station in a future mobile communication system, or an access node in a Wi-Fi system. The RAN node may be a macro base station (for example, 110a in FIG. 4A), may be a micro base station or an indoor base station (for example, 110b in FIG. 4A), or may be a relay node or a donor node.

[00125] In another application scenario, a plurality of RAN nodes may cooperate to help a terminal implement radio access, and different RAN nodes separately implement some functions of a base station. For example, the RAN node may be a central unit (central unit, CU), a distributed unit (distributed unit, DU), a radio unit (radio unit, RU), or the like. The CU herein completes functions of a radio resource control protocol layer and a packet data convergence protocol (packet data convergence protocol, PDCP) layer of the base station, and may further complete functions of a service data adaptation protocol (service data adaptation protocol, SDAP) layer. The DU completes functions of a radio link control layer and a medium access control (medium access control, MAC) layer of the base station, and may further complete some or a part of functions of a physical layer. For specific descriptions of the foregoing protocol layers, refer to related technical specifications in 3GPP. The RU may be configured to implement a transceiver function of a radio frequency signal. The CU and the DU may be two independent RAN nodes, or may be integrated into a same RAN node, for example, integrated into a baseband unit (baseband unit, BBU). The RU may be included in a radio frequency device, for example, included in a remote radio unit (remote radio unit, RRU) or an active antenna unit (active antenna unit, AAU). The CU may be classified into two types of RAN nodes at a CU-control plane and a CU-user plane.

[00126] In different systems, the RAN node may have a different name. For example, in an O-RAN system, a CU may be referred to as an open CU (open CU, O-CU), a DU may be referred to as an open DU (open DU, O-DU), and an RU may be referred to as an open RU (open RU, O-RU). The RAN node in embodiments of this application may be implemented by using a software module, a hardware module, or a combination of a software module and a hardware module. For example, the RAN node may be a server to which a corresponding software module is loaded. A specific technology and a specific device form that are used by the RAN node are not limited in embodiments of this application. For ease of description, the following uses a base station as an example of the RAN node for description.

[00127] FIG. 4B is a diagram of an O-RAN system. It may be understood that the O-RAN system may include other components in addition to the components shown in FIG. 4B. As shown in FIG. 4B, an access network device RAN (which may be, for example, an eNB, a gNB, or a next-generation access network device) communicates with a core network (core network, CN) via a backhaul (Backhaul) link, and communicates with user equipment (UE) via an air interface. Specifically, a baseband unit (baseband unit, BBU) in the access network device may communicate with the CN via the backhaul (backhaul) link, and a radio unit (radio unit, RU) in the access network device may communicate with at least one UE via the air interface. The BBU communicates with at least one RU via a fronthaul link. The BBU and the RU may be co-located, or may not be co-located. The BBU includes at least one control unit (control unit, CU) and at least one distributed unit (distributed unit, DU), which may communicate with each other via at least one midhaul (Midhaul) link. For example, in this embodiment of this application, if a base station (gNB) transmits at least one source TB (source TB) and/or a parity TB to a terminal device (UE), the BBU may send the at least one source TB and/or the parity TB to the terminal device. In addition, the base station may implement outer encoding, channel encoding, and the like through the DU and the RU, and send the at least one source TB and/or the parity TB to the terminal device.

[00128] The terminal is a device having wireless sending and receiving functions, and may send a signal to a base station, or receive a signal from a base station. The terminal may alternatively be referred to as a terminal device, user equipment (UE), a mobile station, a mobile terminal, or the like. The terminal may be widely used in various scenarios, such as device-to-device (device-to-device, D2D) communication, vehicle-to-everything (vehicle-to-everything, V2X) communication, machine-type communication (machine-type communication, MTC), the internet of things (internet of things, IoT), virtual reality, augmented reality, industrial control, autonomous driving, telemedicine, a smart grid, smart furniture, a smart office, a smart wearable, smart transportation, and a smart city. The terminal may be a mobile phone, a tablet computer, a computer with a wireless transceiver function, a wearable device, a vehicle, an airplane, a ship, a robot, a

robotic arm, a smart home device, or the like. A specific technology and a specific device form that are used by the terminal are not limited in embodiments of this application.

[00129] The base station and the terminal may be fixed or movable. The base station and the terminal may be deployed on land, including an indoor or outdoor device, a hand-held device, or a vehicle-mounted device, or may be deployed on water, or may be deployed on an airplane, a balloon, or an artificial satellite. Application scenarios of the base station and the terminal are not limited in embodiments of this application.

[00130] Roles of the base station and the terminal may be relative. For example, a helicopter or an uncrewed aerial vehicle 120i in FIG. 4A may be configured as a mobile base station, and for a terminal 120j accessing the radio access network 100 through 120i, the terminal 120i is a base station. However, for the base station 110a, 120i is a terminal. In other words, communication between 110a and 120i is performed based on a radio air interface protocol. Certainly, communication between 110a and 120i may alternatively be performed based on an interface protocol between base stations. In this case, for 110a, 120i is also a base station. Therefore, both the base station and the terminal may be collectively referred to as communication apparatuses, 110a and 110b in FIG. 4A each may be referred to as a communication apparatus having a base station function, and 120a to 120j in FIG. 4A each may be referred to as a communication apparatus having a terminal function.

[00131] Communication between the base station and the terminal, between the base station and the base station, or between the terminal and the terminal may be performed by using a licensed spectrum, or may be performed by using an unlicensed spectrum, or may be performed by using both the licensed spectrum and the unlicensed spectrum. Communication may be performed by using a spectrum below 6 gigahertz (gigahertz, GHz), or may be performed by using a spectrum above 6 GHz, or may be simultaneously performed by using the spectrum below 6 GHz and the spectrum above 6 GHz. A spectrum resource used for wireless communication is not limited in embodiments of this application.

[00132] In embodiments of this application, a function of the base station may be performed by a module (for example, a chip) in the base station, or may be performed by a control subsystem including the function of the base station. The control subsystem including the function of the base station herein may be a control center in the foregoing application scenarios, such as a smart grid, industrial control, smart transportation, and a smart city. The function of the terminal may be performed by a module (for example, a chip or a modem) in the terminal, or may be performed by an apparatus including the function of the terminal.

[00133] In this application, the base station sends a downlink signal or downlink information to the terminal, where the downlink information is carried on a downlink channel; and the terminal

sends an uplink signal or uplink information to the base station, where the uplink information is carried on an uplink channel. To communicate with the base station, the terminal needs to establish a wireless connection to a cell controlled by the base station. The cell that establishes the wireless connection to the terminal is referred to as a serving cell of the terminal. When communicating with the serving cell, the terminal is further interfered by a signal from a neighboring cell.

[00134] In another example, FIG. 4C is a diagram of an architecture of another communication system to which an embodiment of this application is applicable. The communication system includes a satellite, a terminal device, and a gateway. The satellite may be a highly elliptical orbit (highly elliptical orbit, HEO) satellite, a geostationary earth orbit (geostationary earth orbit, GEO) satellite, a medium earth orbit (medium earth orbit, MEO) satellite, or a low earth orbit (low earth orbit, LEO) satellite. In addition, an NTN system may further include a high-altitude platform station (high-altitude platform station, HAPS) and the like. This is not limited herein. The gateway (gateway) (or referred to as a ground station, an earth station, a signal gateway station, or a gateway station) may be configured to connect the satellite and a terrestrial base station gateway station/signal gateway station (gateway). One or more satellites may be connected to one or more terrestrial base stations through one or more gateways. This is not limited herein. The terminal device includes, for example, a mobile phone and an airplane (which are used as an example in FIG. 4C). A link between the satellite and the terminal device is referred to as a service link (service link), and a link between the satellite and the gateway is referred to as a feeder link (feeder link).

[00135] An operating mode of the satellite is not limited in embodiments of this application. For example, the operating mode of the satellite may be a transparent (transparent) mode, or may be a regenerative (regenerative) mode.

[00136] In transparent mode, the satellite, as an analog radio frequency repeater, has a relay forwarding function, can implement radio frequency conversion and amplification, and can transparently transmit or replicate a signal between the base station and the terminal device. For example, a signal sent by the terminal device may be transparently transmitted via the satellite, and forwarded by the gateway to the terrestrial base station. The gateway has a part or all of functions of the base station. In this case, the gateway may be considered as a base station. It may be considered that a network element and the base station may be deployed together or separately. If the gateway and the base station are separately deployed, a delay of the feeder link includes a delay from the satellite to the gateway and a delay from the gateway to the base station.

[00137] In regenerative mode, the satellite, as a base station for wireless communication, has a part or all of functions of the base station, implements regeneration of signals received from the ground, and may understand and process these signals. For example, the satellite may be a base station mounted on an artificial earth satellite or a high-altitude aircraft. For example, the base

station may be an evolved NodeB (eNB) or a 5G base station (gNB). The gateway may forward signaling between the satellite (that is, the base station) and a core network.

[00138] A system architecture and a service scenario described in embodiments of this application are intended to describe the technical solutions in embodiments of this application more clearly, and do not constitute a limitation on the technical solutions provided in embodiments of this application. A person of ordinary skill in the art may know that with evolution of the system architecture and emergence of new service scenarios, the technical solutions provided in embodiments of this application are also applicable to similar technical problems.

[00139] In this application, names of messages in the following procedures are merely used as examples. With evolution of communication technologies, names of information/messages in the following procedures may change. However, regardless of how the names change, provided that meaning of the information/messages is the same as a function or meaning of messages in this application, the information/messages fall within the protection scope of this application. For example, the first information in this application may also be replaced with downlink control information (downlink control information, DCI), a media access control (MAC) message, or the like. A length of information bits may be replaced with a quantity of the information bits, or the like.

[00140] The following correspondingly describes the solution provided in this embodiment of this application.

[00141] An embodiment of this application provides a resource allocation method. The method may be applicable to but is not limited to the communication system shown in FIG. 4A or FIG. 4C. The method may be performed by a first communication apparatus, or may be performed by a component (a module, a chip, or the like) corresponding to a first communication apparatus, or may be performed by an apparatus that is correspondingly used in cooperation with the first communication apparatus. It may be understood that, in this application, a specific structure of an execution body of the method provided in embodiments of this application and a quantity of execution bodies are not specifically limited, provided that a program that records code of the method provided in embodiments of this application can be run to perform communication according to the method provided in embodiments of this application. It should be noted that the resource allocation method provided in this embodiment of this application is applicable to both a data transmit end and a data receive end. Therefore, in the following, the first communication apparatus may be used as a data sending apparatus (namely, a transmit end) or a receiving apparatus (namely, a receive end). For example, in the communication system shown in FIG. 4A, the first communication apparatus may be a terminal device or a network device (for example, a base station). In the communication system shown in FIG. 4C, the first communication apparatus

may be a terminal device or a satellite on the ground. Unless otherwise specified, a "terminal device" may refer to the terminal device itself, or may refer to a component in the terminal device, for example, a chip or a chip system. A "network device (including an access network device, for example, a base station or a satellite)" may refer to the network device itself, or may refer to a component in the network device, for example, a chip or a chip system. A sequence of steps in the following procedures is merely an example. During actual application, the sequence of steps in the procedures may be adjusted.

[00142] Refer to FIG. 5. A specific procedure of the method may include the following steps.

[00143] S501: A first communication apparatus determines a first transmission resource, where the first transmission resource includes transmission resources respectively corresponding to M transport blocks, at least two of the M transport blocks correspond to transmission resources of unequal sizes, and M is an integer greater than 1.

[00144] In the first transmission resource, that at least two of the M transport blocks correspond to transmission resources of unequal sizes may be that the M transport blocks correspond to transmission resources of unequal sizes, or may be that some of the M transport blocks correspond to transmission resources of unequal sizes. This is not limited herein.

[00145] In this embodiment of this application, the M transport blocks (transport block, TB) may be obtained through outer encoding. The M transport blocks include at least one information transport block and/or at least one parity transport block. The information transport block is a transport block used to carry original information bits (or source bits), and the original information bits (or source bits) carry actual and valid information or data. The parity transport block is a transport block used to carry a parity bit. The parity transport block may be used to assist in decoding the information transport block. For example, outer encoding may be performed on the information transport block, to obtain the parity transport block. In this embodiment of this application, decoding processing may include outer decoding and/or channel decoding.

[00146] For example, in the communication system shown in FIG. 4A or FIG. 4C, the first communication apparatus may be a network device (for example, a base station or a satellite), or may be a terminal device. This is not limited herein.

[00147] If the first communication apparatus is a transmit end/transmitting apparatus, after obtaining the M second transmission resources of equal sizes based on the first transmission resource, the first communication apparatus may send the M transport blocks to a receive end/receiving apparatus (for example, the second communication apparatus) based on the M second transmission resources. If the first communication apparatus is a receive end/receiving apparatus, after obtaining the M second transmission resources of equal sizes based on the first transmission resource, the first communication apparatus may receive, based on the M second

transmission resources, the M transport blocks sent by a transmit end/transmitting apparatus (for example, a second communication apparatus).

[00148] In a possible implementation, the method may further include: The first communication apparatus receives first information, where the first information indicates information about the first transmission resource, and the information about the first transmission resource includes a size of the first transmission resource.

[00149] For example, if the first communication apparatus is a terminal device, and the first transmission resource is configured or scheduled by the base station for the M transport blocks, the first communication apparatus may receive the first information from the base station, where the first information indicates the information about the first transmission resource.

[00150] For example, the first information may be carried in downlink control information DCI, a media access control MAC message, or the like.

[00151] In this embodiment of this application, if the first communication apparatus is a network device (for example, a base station), the first communication apparatus may configure or schedule the first transmission resource for the M transport blocks, and may indicate or send the information about the first transmission resource to the terminal device. For example, the base station sends the DCI to the terminal device, where the DCI indicates the information about the first transmission resource.

[00152] In the foregoing description, the information about the first transmission resource includes the size of the first transmission resource, and may further include a type of the first transmission resource, and the like. For example, the first transmission resource is an uplink transmission resource or a downlink transmission resource, and the first transmission resource includes a time domain resource and/or a frequency domain resource.

[00153] S502: The first communication apparatus obtains, based on the first transmission resource, M second transmission resources for transmitting the M transport blocks, where all the second transmission resources are of equal size.

[00154] In this embodiment of this application, that the first communication apparatus obtains, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks may include but is not limited to: evenly allocating the first transmission resource, to obtain the M second transmission resources.

[00155] In a possible implementation, the first transmission resource includes transmission resources corresponding to M time units, and the M time units are in a one-to-one correspondence with the M transport blocks. A transmission resource corresponding to each time unit may include a time domain resource and/or a frequency domain resource. In this embodiment of this application, the time unit may be but is not limited to a radio frame, a subframe, a slot, or a symbol.

[00156] In the foregoing description, the M time units may be adjacent time units, or may be non-adjacent time units. For example, the first transmission resource includes transmission resources corresponding to M slots, and the resources corresponding to the M slots may be in a one-to-one correspondence with the M transport blocks for transmission/carrying. The M slots may be adjacent slots, or may be non-adjacent slots, or may be partially adjacent and partially non-adjacent. This is not specifically limited herein.

[00157] In a possible implementation, the first transmission resource includes K time-frequency units, and K is an integer greater than M or equal to M. In this embodiment of this application, the time-frequency unit may be but is not limited to a resource block (resource block, RB), a resource element (resource element, RE), or a resource block group (resource block group, RBG). Further, that the first communication apparatus evenly allocates the first transmission resource, to obtain the M second transmission resources may include: evenly allocating the K time-frequency units, to obtain the M second transmission resources, where all the second transmission resources have equal quantities of time-frequency units.

[00158] In a possible implementation, if a ratio of K to M is a non-integer, the K time-frequency units cannot be evenly allocated to the M second transmission resources. The first communication apparatus may evenly allocate the first transmission resource, to obtain the M second transmission resources in, but not limited to, the following manner.

[00159] The first communication apparatus evenly allocates, based on a target value Q, the K time-frequency units to obtain the M second transmission resources, where each second transmission resource has a quantity of time-frequency units equal to the target value Q, the target value Q is obtained by rounding down the ratio of K to M, and Q is a positive integer.

[00160] In this implementation, if the K time-frequency units cannot be evenly divided into M second transmission resources whose quantities of time-frequency units are integers, the K time-frequency units are evenly divided by rounding down the integer. In other words, some time-frequency units may be selected from the K time-frequency units and are not for transmitting the M transport blocks. In this way, remaining time-frequency units in the K time-frequency units can be evenly divided into the M second transmission resources, and the second transmission resources include the same quantity of time-frequency units, and the quantity is an integer, so that corresponding time-frequency units for transmitting the M transport blocks can be ensured to be of equal size.

[00161] In a possible implementation, the first transmission resource further includes N remaining time-frequency units, where N=K–Q*M, N is a positive integer, and "*" is a multiplication sign.

[00162] In this embodiment of this application, positions of the N time-frequency units in the

K time-frequency units may be preset or agreed on in a protocol, or may be determined by the first communication apparatus, or may be randomly selected. This is not limited herein. In this implementation, the time-frequency units that are not for transmitting the M transport blocks may be flexibly selected or set from the K time-frequency units. In a possible implementation, the N time-frequency units may be used for TB transmission in a next round or a next period. This is not limited herein.

[00163] In conclusion, this embodiment of this application provides the resource allocation method. The method includes: The first communication apparatus determines the first transmission resource, where the first transmission resource includes the transmission resources respectively corresponding to the M transport blocks, the at least two of the M transport blocks correspond to the transmission resources of the unequal sizes, and M is an integer greater than 1; and obtains, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks, where all the second transmission resources are of equal size. According to the method, the transmission resources corresponding to the transport blocks TBs after outer encoding can be ensured to be equal, thereby meeting transmission requirements (or demands) of each TB after outer encoding.

[00164] The following describes the solution in FIG. 5 in detail by using several specific implementations.

[00165] Implementation 1: In the implementation 1, the first communication apparatus uses a terminal device (UE) as an example. The terminal device is used as a data transmit end. After performing outer encoding, the terminal device obtains M transport blocks (the transport blocks are referred to as TBs for short in the following). The M transport blocks include at least one source transport block (source TB) and at least one parity transport block (parity TB). The terminal device may allocate equal time-frequency resources (that is, an example of transmission resources) to the M transport blocks, and then send the M transport blocks to a base station (gNB) based on the equal time-frequency resources. Refer to FIG. 6A. A procedure of the implementation 1 may include the following steps.

[00166] S601A: The gNB configures M groups of time-frequency resources (which may also be referred to as M slot resources) for the UE, where the M groups of time-frequency resources are in a one-to-one correspondence with M TBs for transmission, at least two of the M groups of time-frequency resources are of unequal size, the M TBs include x source TBs (source TBs) and y parity TBs (parity TBs), and a sum of x and y is an integer greater than 1.

[00167] In a possible implementation, the gNB sends DCI information to the UE, where the DCI information (an example of the first information in the solution in FIG. 5) indicates sizes of the M groups of time-frequency resources (an example of the first transmission resources in the

solution in FIG. 5).

[00168] For example, after performing outer encoding, the UE side obtains six TBs, including four source TBs (namely, a source TB 1, a source TB 2, a source TB 3, and a source TB 4) and two parity TBs (namely, a parity TB 1 and a parity TB 2). Because the six TBs after outer encoding have equal information bit lengths, and same modulation schemes and channel encoding code rates, the six TBs need to be transmitted through time-frequency resources of equal sizes. Refer to FIG. 6B. The base station configures time-frequency resources (namely, six groups of time-frequency resources) corresponding to six slots for the UE, and a time-frequency resource corresponding to each slot is for transmitting one TB. Because in the time-frequency resources corresponding to the six slots, time-frequency resources of different sizes may be occupied or used by other signals, the six slots for transmitting the TBs correspond to time-frequency resources of unequal sizes/quantities. It is clear that a demand for transmitting the six TBs cannot be met.

[00169] If a same quantity of time-frequency resources is scheduled in each slot, a minimum quantity of time-frequency resources in a plurality of slots needs to be agreed as a quantity of scheduled resources in all slots. This greatly affects transmission performance.

[00170] S602A: The UE equally divides the M groups of time-frequency resources again, to obtain M resource groups with equal time-frequency resource sizes, where the M resource groups are in a one-to-one correspondence with the M TBs for carrying/transmission.

[00171] For example, as shown in FIG. 6C, time-frequency resources corresponding to the six slots (namely, a slot 0, a slot 1, a slot 2, a slot 3, a slot 4, and a slot 5) are in a one-to-one correspondence with six TBs (four source TBs and two parity TBs) for transmission. In other words, a time-frequency resource corresponding to one slot is for transmitting one TB. A total of a RBs in a plurality of symbols in the slot 0 may be for transmitting data, a total of b RBs in a plurality of symbols in the slot 1 may be for transmitting data, a total of c RBs in a plurality of symbols in the slot 2 may be for transmitting data, a total of d RBs in a plurality of symbols in the slot 3 may be for transmitting data, a total of e RBs in a plurality of symbols in the slot 4 may be for transmitting data, and a total of f RBs in a plurality of symbols in the slot 5 may be for transmitting data. At least two of values of a, b, c, d, e, and f are not equal.

[00172] The UE equally divides, into six resource groups, the time-frequency resources corresponding to the six slots (the six slots are an example of the M time units in the solution in FIG. 5) configured by the base station, where the six resource groups are sequentially used to carry/transmit six TBs, and a quantity of RBs in each resource group is equal to (a+b+c+d+e+f)/6. When resources are allocated to each resource group, the resources may be allocated in a sequence of frequency domain first and then time domain.

[00173] Optionally, the gNB and the UE may mutually agree in advance that a quantity of slots

configured by the gNB for the UE is equal to a quantity of TBs obtained after the UE performs outer encoding.

[00174] After S602A, the UE may map the M TBs to resource blocks RBs in the M resource groups in a one-to-one correspondence, and send the M TBs to the gNB.

[00175] In this implementation, an example in which an RB is used as a resource unit (an example of the time-frequency unit in the solution described in FIG. 5) is used. In actual application, an RBG, an RE, or the like may also be used as a resource unit. This is not limited herein. In addition, in the foregoing, the solution is described by using an example in which time-frequency resources corresponding to M adjacent slots are for transmitting the M TBs. In actual use, time-frequency resources corresponding to M non-adjacent slots may alternatively be for transmitting the M TBs. This is not limited herein.

[00176] In the foregoing, the base station allocates, to the UE, the M groups of time-frequency resources for transmitting the TBs after outer encoding, and the UE may reallocate or adjust, based on the M groups of unequal time-frequency resources, sizes of the corresponding time-frequency resources for the M TBs, so that the M TBs can be effectively sent. Similarly, the base station side may also adjust/readjust, in a same manner, the M groups of time-frequency resources configured by the base station, so that time-frequency resources for transmitting the M TBs are of equal size, and the M TBs can be effectively sent.

[00177] In the implementation 1, the base station configures, for the UE, a plurality of groups of time-frequency resources for transmitting a plurality of source TBs and parity TBs after outer encoding. When at least two of the plurality of groups of time-frequency resources are of unequal size, the UE may reallocate or adjust the plurality of groups of time-frequency resources, so that the time-frequency resources for transmitting all the TBs are equal. In this way, a problem that time-frequency resources correspondingly allocated to the plurality of TBs after outer encoding are not equal can be effectively resolved, and a transmission requirement (or demand) of each TB after outer encoding can be met.

[00178] Implementation 2: The method in this embodiment of this application is described in the foregoing implementation 1 for a scenario in which source TBs (source TBs) and parity TBs (parity TBs) are simultaneously sent. In the implementation 2, the method in this embodiment of this application is described for a scenario in which source TBs (source TBs) and parity TBs (parity TBs) are separately sent. Refer to FIG. 7A. A procedure of the implementation 2 may include the following steps.

[00179] S701A: A gNB configures x groups of time-frequency resources (which may also be referred to as x slot resources) for UE, where the x groups of time-frequency resources are in a one-to-one correspondence with x source TBs (source TBs) for transmission, at least two of the x

groups of time-frequency resources are of unequal size, and x is an integer greater than 1.

[00180] For example, referring to FIG. 7B(1), four slot resources for transmitting four source TBs (source TBs) are used as an example. In a total of a RBs in a plurality of symbols of a slot 0 (slot 0) may be for transmitting data, a total of b RBs in a plurality of symbols of a slot 1 (slot 1) may be for transmitting data, a total of c RBs in a plurality of symbols of a slot 2 (slot 2) may be for transmitting data, and a total of d RBs in a plurality of symbols of a slot 3 (slot 3) may be for transmitting data. At least two of values of a, b, c, and d are not equal.

[00181] Optionally, for the configuration of the gNB in S701A, the gNB and the UE may mutually agree in advance that the quantity of slots (or the quantity of groups of time-frequency resources) configured by the gNB for the UE is equal to the quantity of source TBs (source TBs) obtained after the UE performs outer encoding.

[00182] S702A: The UE equally divides the x groups of time-frequency resources again, to obtain x resource groups with equal time-frequency resource sizes, where the x resource groups are in a one-to-one correspondence with the x source TBs (source TBs) for carrying/transmission.

[00183] For example, referring to FIG. 7C(1), the UE may reallocate four slot resources for transmitting four source TBs (source TBs), that is, equally divide the four slot resources into four resource groups. As shown by a bold dashed line in FIG. 7C(1), the four resource groups are in a one-to-one correspondence with the four source TBs (source TBs) for transmission, and each resource group includes (a+b+c+d)/4 RBs.

[00184] S703A: The gNB configures y groups of time-frequency resources (which may also be referred to as y slot resources) for the UE, where the y groups of time-frequency resources are in a one-to-one correspondence with y parity TBs (parity TBs) for transmission, at least two of the y groups of time-frequency resources are of unequal size, and y is an integer greater than 1.

[00185] For example, referring to FIG. 7B(2), two slot resources for transmitting two parity TBs (parity TBs) are used as an example. A total of e RBs in a plurality of symbols of the slot 4 (slot 4) may be for transmitting data, and a total of f RBs in a plurality of symbols of the slot 5 (slot 5) may be for transmitting data, where values of e and f are not equal.

[00186] Optionally, for the configuration of the gNB in S703A, the gNB and the UE may mutually agree in advance that the quantity of slots (or the quantity of groups of time-frequency resources) configured by the gNB for the UE is equal to the quantity of parity TBs (parity TBs) obtained after the UE performs outer encoding.

[00187] S704A: The UE equally divides y groups of time-frequency resources again, to obtain y resource groups with equal time-frequency resource sizes, where the y resource groups are in a one-to-one correspondence with the y parity TBs (parity TBs) for carrying/transmission.

[00188] For example, referring to FIG. 7C(2), the UE may reallocate two slot resources for

transmitting two parity TBs (parity TBs), that is, equally divide the two slot resources into two resource groups. As shown by a bold dashed line in FIG. 7C(2), the two resource groups are in a one-to-one correspondence with the two parity TBs (parity TBs) for carrying/transmission, and each resource group includes (e+f)/2 RBs.

[00189] It should be noted that a sequence of performing the foregoing several steps in the implementation 2 is not strictly limited in this application, and the sequence of performing the foregoing several steps may be correspondingly adjusted based on an actual application. For example, a sequence of S701A and S703A is not limited. That is, a sequence of configuring, by the base station for the UE, the time-frequency resources for transmitting the x source TBs and configuring, by the base station for the UE, the time-frequency resources for transmitting the y parity TBs is not specifically limited.

[00190] After S702A, the UE may map the x source TBs (source TBs) to the RBs in the x resource groups in a one-to-one correspondence, to send the x source TBs to the base station. After S704A, the UE may map the y parity TBs (parity TBs) to the RBs in the y resource groups in a one-to-one correspondence, to send the y parity TBs to the base station.

[00191] In the implementation 2, an example in which a resource block RB is used as a resource unit is used. In actual application, a resource block group RBG, a resource element RE, or the like may also be used as a resource unit. This is not limited herein. In addition, in the foregoing, an example in which time-frequency resources corresponding to x adjacent slots are for transmitting the x source TBs (source TBs) is used to describe the solution. In actual use, time-frequency resources corresponding to x non-adjacent slots may alternatively be for transmitting the x source TBs (source TBs). Similarly, time-frequency resources corresponding to y non-adjacent slots may alternatively be for transmitting the y parity TBs (parity TBs).

[00192] Similarly, the base station side may adjust/reallocate, in the same implementation as that of the UE, the x groups of time-frequency resources configured by the base station and for transmitting the x source TBs, to ensure that the time-frequency resources for transmitting the x source TBs are equal. In addition, the base station side may further adjust/reallocate the y groups of time-frequency resources configured by the base station and for transmitting the y parity TBs (parity TBs), to ensure that the time-frequency resources for transmitting the y parity TBs (parity TBs) are equal.

[00193] In the implementation 2, the base station configures, for the UE, a plurality of groups of time-frequency resources for transmitting a plurality of source TBs (or parity TBs) after outer encoding. When at least two of the plurality of groups of time-frequency resources are of unequal size, the UE may reallocate/adjust the plurality of groups of time-frequency resources, so that the time-frequency resources for transmitting all the source TBs (or parity TBs) are equal. In this way,

a problem that time-frequency resources correspondingly allocated to the plurality of source TBs (or the plurality of parity TBs) after outer encoding are not equal can be effectively resolved, and a transmission requirement (or demand) of each source TB (or parity TB) after outer encoding can be met.

[00194] Implementation 3: In the foregoing implementation 1, the quantity of the M groups of time-frequency resources configured by the gNB for the UE and for transmitting the M TBs can be equally divided into M resource groups including an integer quantity of resources. Different from that in the foregoing implementation 1, in the implementation 3, in a scenario in which the quantity of the M groups of time-frequency resources configured by the gNB for the UE and for transmitting the M TBs cannot be equally divided into m resource groups including an integer quantity of resources, how to implement that the TBs correspond to the time-frequency resources of the equal sizes. Refer to FIG. 8A. A procedure of the implementation 3 may include the following steps.

[00195] S801A: The gNB configures M groups of time-frequency resources (which may also be referred to as M slot resources) for the UE, where the M groups of time-frequency resources are in a one-to-one correspondence with M TBs for transmission, at least two of the M groups of time-frequency resources are of unequal size, the M TBs include x source TBs (source TBs) and y parity TBs (parity TBs), and a sum of x and y is an integer greater than 1.

[00196] In a possible implementation, the gNB sends DCI information to the UE, where the DCI information (an example of the first information in the solution in FIG. 5) indicates sizes of the M groups of time-frequency resources (an example of the first transmission resources in the solution in FIG. 5).

[00197] For example, referring to FIG. 8B, six slot resources for transmitting six TBs (that is, four source TBs and two parity TBs) are used as an example. A total of 22 RBs in a plurality of symbols in the slot 0 (slot 0) may be for transmitting data, a total of 30 RBs in a plurality of symbols in the slot 1 (slot 1) may be for transmitting data, a total of 20 RBs in a plurality of symbols in the slot 2 (slot 2) may be for transmitting data, a total of 30 RBs in a plurality of symbols in the slot 3 (slot 3) may be for transmitting data, a total of 26 RBs in a plurality of symbols in the slot 4 (slot 4) may be for transmitting data, and a total of 32 RBs in a plurality of symbols in the slot 5 (slot 5) may be for transmitting data. Because the quantities of RBs for transmitting the TBs in the six slots are not equal, the requirement for transmitting the six TBs is not met.

[00198] S802A: The UE equally divides the M groups of time-frequency resources again, to obtain M resource groups with equal time-frequency resource sizes, where the M resource groups are in a one-to-one correspondence with the M TBs for carrying/transmission.

[00199] In a possible implementation, a size T of time-frequency resources included in each resource group meets the following formula:

$$T = \lfloor Q/M \rfloor.$$

[00200] Q is a total quantity of the M groups of time-frequency resources, / is a division sign, and $\lfloor\ \rfloor$ is a rounding-down operator.

[00201] For example, referring to FIG. 8B, a total quantity Q of available RBs in the six slots is equal to 22+30+20+30+26+32=160. All available RBs in the six slots are equally divided into six resource groups (as shown by bold dashed lines in FIG. 8B), and the six resource groups are in a one-to-one correspondence with the six TBs for transmission. Each resource group has a quantity T of available RBs equal to $\lfloor Q/6 \rfloor = \lfloor 160/6 \rfloor = 26$. In the six slots, four remaining RBs (that is, an example of the N remaining time-frequency units in the first transmission resource in the solution shown in FIG. 5) may not be used for transmission (that is, not used).

[00202] In this embodiment of this application, which four RBs in the RBs corresponding to the six slots are specifically the remaining four RBs (that is, positions of the remaining four RBs) may be preset or agreed on through a protocol, or may be indicated by the base station to the UE, or may be determined by the UE. For example, the remaining four RBs may be the first four RBs or the last four RBs. This is not limited.

[00203] It can be learned from the foregoing that the UE may choose not to use some of the time-frequency resources. In this way, a problem that the quantity of the M groups of time-frequency resources cannot be equally divided into M resource groups including an integer quantity of resources can be effectively resolved.

[00204] In the implementation 3, the gNB configures, for the UE, a plurality of groups of time-frequency resources for transmitting a plurality of TBs after outer encoding. This implementation can effectively resolve the problem that the plurality of groups of time-frequency resources cannot be equally divided into M resource groups including an integer quantity of resources, and finally can effectively resolve the problem that time-frequency resources correspondingly allocated to the TBs after outer encoding are not equal, thereby meeting transmission requirements (or demands) of the TBs after outer encoding.

[00205] For the foregoing implementation 1 to the implementation 3, it should be noted that:

[00206] (1) The foregoing implementation 1 to the implementation 3 may be separately implemented, or may be partially implemented in combination. This is not specifically limited herein.

[00207] (2) The foregoing descriptions focus on differences among the implementation 1 to the implementation 3. For other content than the differences, the implementation 1 to the implementation 3 may be mutually referenced.

[00208] (3) Step numbers in the flowcharts described in the implementation 1 to the implementation 3 are merely an example of an execution procedure, and do not constitute a limitation on an execution sequence of the steps. In the implementations of this application, there is no strict execution sequence between steps that do not have a time sequence dependency relationship with each other. In addition, not all steps shown in each flowchart are mandatory, and some steps may be added or deleted for each flowchart based on an actual requirement.

[00209] In the foregoing embodiments provided in this application, the method provided in embodiments of this application is described from a perspective of interaction between the devices. To implement the functions in the method provided in the foregoing embodiments or the implementations of this application, the first communication apparatus may include a hardware structure and/or a software module, to implement the functions in a form of the hardware structure, the software module, or a combination of the hardware structure and the software module. Whether a function in the foregoing functions is performed by using the hardware structure, the software module, or the combination of the hardware structure and the software module depends on particular applications and design constraints of the technical solutions.

[00210] In this embodiment of this application, module division is an example, and is merely a logical function division. In actual implementation, another division manner may be used. In addition, functional modules in embodiments or implementations of this application may be integrated into one processor, or may exist alone physically, or two or more modules may be integrated into one module. The integrated module may be implemented in a form of hardware, or may be implemented in a form of a software functional module.

[00211] Same as the foregoing concept, as shown in FIG. 9, an embodiment of this application further provides a communication apparatus 900, configured to implement functions of the first communication apparatus in the foregoing method. For example, the communication apparatus 900 may be a software module or a chip system. In this embodiment of this application, the chip system may include a chip, or may include a chip and another discrete component. The communication apparatus 900 may include a communication unit 901 and a processing unit 902.

[00212] In this embodiment of this application, the communication unit 901 may also be referred to as a transceiver unit, and may include a sending unit and/or a receiving unit, which are respectively configured to perform the sending and receiving steps of the first communication apparatus in the foregoing method embodiments. The processing unit 902 may be configured to read instructions and/or data in a storage module, to enable the communication apparatus 900 to implement the foregoing method embodiments.

[00213] Optionally, the communication apparatus 900 may further include a storage unit 903. The storage unit 903 is equivalent to a storage module, and may be configured to store instructions

and/or data.

[00214] The communication apparatus provided in embodiments of this application is described in detail with reference to FIG. 9 and FIG. 10. It should be understood that descriptions of apparatus embodiments correspond to the descriptions of the method embodiments. Therefore, for content that is not described in detail, refer to the manner shown in FIG. 5. For brevity, details are not described herein again.

[00215] The communication unit 901 may also be referred to as a transceiver, a transceiver machine, a transceiver apparatus, and the like. The processing unit may also be referred to as a processor, a processing board, a processing module, a processing apparatus, or the like. Optionally, a component that is in the communication unit 901 and that is configured to implement a receiving function may be considered as a receiving unit, and a component that is in the communication unit 901 and that is configured to implement a sending function may be considered as a sending unit. In other words, the communication unit 901 includes the receiving unit and the sending unit. The communication unit 901 sometimes may also be referred to as a transceiver machine, a transceiver, a transceiver circuit, or the like. The receiving unit sometimes may also be referred to as a receiver machine, a receiver, a receive circuit, or the like. The sending unit sometimes may also be referred to as a transmitter machine, a transmitter, a transmit circuit, or the like.

[00216] When the communication apparatus 900 performs the first communication apparatus in the procedure shown in FIG. 5 in the foregoing embodiment, the processing unit 902 is configured to determine a first transmission resource, where the first transmission resource includes transmission resources respectively corresponding to M transport blocks, at least two of the M transport blocks correspond to transmission resources of unequal sizes, and M is an integer greater than 1; and the communication unit 901 is configured to obtain, based on the first transmission resource, M second transmission resources for transmitting the M transport blocks, where all the second transmission resources are of equal size.

[00217] The foregoing is merely an example. The processing unit 902 and the communication unit 901 may further perform other functions. For more detailed descriptions, refer to related descriptions in the method embodiments shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A. Details are not described herein again.

[00218] FIG. 10 shows a communication apparatus 1000 according to an embodiment of this application. The communication apparatus shown in FIG. 10 may be an implementation of a hardware circuit of the communication apparatus shown in FIG. 9. The communication apparatus 1000 may be applicable to the flowcharts shown above, and perform functions of the first communication apparatus in the foregoing method embodiments. For ease of description, FIG. 10 merely shows main components of the communication apparatus.

[00219] As shown in FIG. 10, the communication apparatus 1000 includes a communication interface 1001 and a processor 1002. The communication interface 1001 and the processor 1002 are coupled to each other. It may be understood that the communication interface 1001 may be a transceiver or an input/output interface, or may be an interface circuit like a transceiver circuit. Optionally, the communication apparatus 1000 may further include a memory 1003, configured to store instructions executed by the processor 1002, input data needed by the processor 1002 to run the instructions, or data generated after the processor 1002 runs the instructions.

[00220] When the communication apparatus 1000 is configured to implement the methods shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A, the communication interface 1001 is configured to implement the function of the communication unit 901, and the processor 1002 is configured to implement the function of the processing unit 902.

[00221] In embodiments of this application, a specific connection medium between the communication interface 1001, the processor 1002, and the memory 1003 is not limited. In this embodiment of this application, in FIG. 10, the memory 1003, the processor 1002, and the communication interface 1001 are connected through a communication bus 1004. The communication bus 1004 is represented by a bold line in FIG. 10. A connection manner between other components is merely an example for description, and is not limited thereto. The communication bus 1004 may be classified into an address bus, a data bus, a control bus, and the like. For ease of representation, only one thick line represents the bus in FIG. 10, but this does not mean that there is only one bus or only one type of bus.

[00222] When the communication apparatus is a chip, FIG. 11 is a diagram of a simplified apparatus structure of the chip. The chip 1100 includes an interface circuit 1101 and one or more processors 1102. Optionally, the chip 1100 may further include a bus.

[00223] The processor 1102 may be an integrated circuit chip and has a signal processing capability. In an implementation process, steps in the foregoing service node information determining method may be completed by using a hardware integrated logic circuit in the processor 1102, or by using instructions in a form of software. The foregoing processor 1102 may be a general-purpose processor, a digital signal processor (digital signal processor, DSP), an application specific integrated circuit (application specific integrated circuit, ASIC), a field programmable gate array (field programmable gate array, FPGA) or another programmable logic device, a discrete gate or transistor logic device, or a discrete hardware component. The processor may implement or perform the methods and steps that are disclosed in embodiments of this application. The general-purpose processor may be a microprocessor, or the processor may be any conventional processor or the like.

[00224] The interface circuit 1101 may be configured to send or receive data, instructions, or

information. The processor 1102 may perform processing by using the data, the instructions, or other information received by the interface circuit 1101, and may send processed information through the interface circuit 1101.

[00225] Optionally, the chip further includes a memory 1103. The memory 1103 may include a read-only memory and a random access memory, and provide operation instructions and data for the processor. A part of the memory 1103 may further include a non-volatile random access memory (non-volatile random access memory, NVRAM).

[00226] Optionally, the memory stores an executable software module or a data structure, and the processor may perform a corresponding operation by invoking the operation instructions stored in the memory (the operation instructions may be stored in an operating system).

[00227] Optionally, the chip may be used in the first communication apparatus in embodiments of this application. Optionally, the interface circuit 1101 may be configured to output an execution result of the processor 1102. For the resource allocation method provided in one or more embodiments of this application, refer to the foregoing embodiments. Details are not described herein again.

[00228] It should be noted that a function corresponding to each of the interface circuit 1101 and the processor 1102 may be implemented by using a hardware design, may be implemented by using a software design, or may be implemented by using a combination of software and hardware. This is not limited herein.

[00229] An embodiment of this application further provides a computer-readable storage medium. The computer-readable storage medium stores computer instructions for implementing the methods performed by the first communication apparatus in the foregoing method embodiments.

[00230] For example, when a computer program is executed by a computer, the computer is enabled to implement the methods performed by the first communication apparatus in the foregoing method embodiments.

[00231] An embodiment of this application further provides a computer program product including instructions. When the instructions are executed by a computer, the computer is enabled to implement the methods performed by the first communication apparatus in the foregoing method embodiments.

[00232] An embodiment of this application further provides a chip, including a processor, configured to invoke a computer program or computer instructions stored in the memory, so that the processor performs the resource allocation methods in the implementations shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A.

[00233] In a possible implementation, an input of the chip corresponds to a receiving operation

in implementations shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A, and an output of the chip corresponds to a sending operation in implementations shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A.

[00234] Optionally, the processor is coupled to the memory through an interface.

[00235] Optionally, the chip further includes the memory. The memory stores the computer program or the computer instructions.

[00236] The processor mentioned in any of the foregoing may be a general-purpose central processing unit, a microprocessor, an ASIC, or one or more integrated circuits configured to control program execution of the resource allocation method in implementations shown in FIG. 5 and FIG. 6A, FIG. 7A, and FIG. 8A. The memory mentioned in any one of the foregoing descriptions may be a read-only memory (read-only memory, ROM), another type of static storage device that can store static information and instructions, a random access memory (random access memory, RAM), or the like.

[00237] It should be noted that, for ease and brevity of description, for explanations and beneficial effects of related content in any one of the foregoing provided communication apparatuses, refer to the corresponding embodiments of the foregoing provided resource allocation method. Details are not described herein again.

[00238] In this application, the communication apparatus may further include a hardware layer, an operating system layer running above the hardware layer, and an application layer running above the operating system layer. The hardware layer may include hardware such as a central processing unit (central processing unit, CPU), a memory management module (memory management unit, MMU), and a memory (also referred to as a main memory). An operating system at the operating system layer may be any one or more computer operating systems that implement service processing by using a process (process), for example, a Linux operating system, a Unix operating system, an Android operating system, an iOS operating system, or a Windows operating system. The application layer may include applications such as a browser, an address book, word processing software, and instant messaging software.

[00239] Division into the modules in embodiments of this application is an example, is merely division into logical functions, and may be other division during actual implementation. In addition, functional modules in embodiments of this application may be integrated into one processor, or each of the modules may exist alone physically, or two or more modules may be integrated into one module. The integrated module may be implemented in a form of hardware, or may be implemented in a form of a software functional module.

[00240] Through descriptions of the foregoing implementations, a person skilled in the art may clearly understand that embodiments of this application may be implemented by hardware,

firmware or a combination thereof. When the present invention is implemented by software, the foregoing functions may be stored in a computer-readable medium or transmitted as one or more instructions or code in the computer-readable medium. The computer-readable medium includes a computer storage medium and a communication medium, where the communication medium includes any medium that enables a computer program to be transmitted from one place to another. The storage medium may be any available medium accessible to a computer. Examples of the computer-readable medium include but are not limited to: a RAM, a ROM, an electrically erasable programmable read only memory (electrically erasable programmable read only memory, EEPROM), a compact disc read-only memory (compact disc read-only memory, CD-ROM) or another optical disc storage, a disk storage medium or another disk storage device, or any other medium that can be used to carry or store expected program code in an instruction or data structure form and can be accessed by a computer. In addition, any connection may be properly defined as a computer-readable medium. For example, if software is transmitted from a website, a server, or another remote source by using a coaxial cable, an optical fiber and optical cable, a twisted pair, a digital subscriber line (digital subscriber line, DSL), or wireless technologies such as infrared, radio, and microwave, the coaxial cable, the optical fiber and optical cable, the twisted pair, the DSL, or the wireless technologies such as infrared, radio, and microwave are included in a definition of a medium to which the coaxial cable, the optical fiber and optical cable, the twisted pair, the DSL, or the wireless technologies such as the infrared ray, the radio, and the microwave belong. For example, a disk (disk) and a disc (disc) used in embodiments of this application include a compact disc (compact disc, CD), a laser disc, an optical disc, a digital video disc (digital video disc, DVD), a floppy disk and a Blu-ray disc. The disk generally copies data by a magnetic means, and the disc copies data optically by a laser means. The foregoing combination should also be included in the protection scope of the computer-readable medium.

[00241] In a word, the foregoing descriptions are merely embodiments of this application and are not intended to limit the protection scope of this application. Any modification, equivalent substitution, and improvement made based on the disclosure of this application shall fall within the protection scope of this application.

CLAIMS

1. A resource allocation method, wherein the method comprises:

determining (501) a first transmission resource, wherein the first transmission resource comprises transmission resources respectively corresponding to M transport blocks, at least two of the M transport blocks correspond to transmission resources of unequal sizes, and M is an integer greater than 1; and

obtaining (502), based on the first transmission resource, M second transmission resources for transmitting the M transport blocks, wherein all the second transmission resources are of equal size.

2. The method according to claim 1, wherein the method further comprises:

receiving first information, wherein the first information indicates information about the first transmission resource, and the information about the first transmission resource comprises a size of the first transmission resource.

3. The method according to claim 1 or 2, wherein the obtaining, based on the first transmission resource, the M second transmission resources for transmitting the M transport blocks comprises:

evenly allocating the first transmission resource to obtain the M second transmission resources.

4. The method according to claim 3, wherein the first transmission resource comprises transmission resources corresponding to M time units, the M time units are in a one-to-one correspondence with the M transport blocks, and the transmission resources comprise a time domain resource and/or a frequency domain resource.

5. The method according to claim 4, wherein the time unit is any one of the following:

a radio frame, a subframe, a slot, or a symbol.

6. The method according to claim 4 or 5, wherein the first transmission resource comprises K time-frequency units, K is an integer greater than M or equal to M, and the time-frequency unit is any one of the following:

a resource block, RB, a resource element (RE), or a resource block group (RBG).

7. The method according to claim 6, wherein the evenly allocating the first transmission resource to obtain the M second transmission resources comprises:

evenly allocating the K time-frequency units to obtain the M second transmission resources, wherein all the second transmission resources have an equal quantity of time-frequency units.

8. The method according to claim 6, wherein when a ratio of K to M is a non-integer, the evenly allocating the first transmission resource to obtain the M second transmission resources comprises:

evenly allocating, based on a target value Q, the K time-frequency units to obtain the M second transmission resources, wherein each second transmission resource has a quantity of time-frequency units equal to the target value Q, the target value Q is obtained by rounding down the ratio of K to M, and Q is a positive integer.

9. The method according to claim 8, wherein the first transmission resource further comprises N remaining time-frequency units, and positions of the N time-frequency units in the K time-frequency units are preset, wherein N=K–Q*M, and N is a positive integer.

10. The method according to any one of claims 1 to 9, wherein the M transport blocks are obtained based on outer encoding; and the M transport blocks comprise at least one information transport block and/or at least one parity transport block, wherein the information transport block is used to carry an original information bit, and the parity transport block is used to assist in decoding the information transport block.

11. A communication apparatus, comprising a unit or a module configured to perform the method according to any one of claims 1 to 10.

12. A communication apparatus, comprising a processor and a memory, wherein the memory is configured to store program instructions; and when the processor executes the program instructions, the method according to any one of claims 1 to 10 is performed.

13. A computer-readable storage medium, wherein the computer-readable storage medium stores computer-readable instructions, and when the computer-readable instructions are run on a communication apparatus, the method according to any one of claims 1 to 10 is performed.

14. A computer program product, wherein when the computer program product runs on a device, the device is enabled to perform the method according to any one of claims 1 to 10.

15. A chip system, wherein the chip system is configured to read and execute program instructions stored in a memory, to implement the method according to any one of claims 1 to 10.