

COMMUNICATION METHOD AND APPARATUS

TECHNICAL FIELD

[0001] This application relates to the communication field, and in particular, to a communication method and apparatus.

5

BACKGROUND

- [0002] Compared with previous generations of mobile communication systems, a 5th generation (5th generation, 5G) mobile communication system has higher requirements on a data transmission rate, data transmission reliability, a transmission latency, and power consumption. For example, requirements of a 5G ultra-reliable and low-latency communication (ultra-reliable and low-latency communication, URLLC) service include: Data transmission reliability reaches 99.999%, a transmission latency is less than 1 millisecond (millisecond, ms), and instruction overheads are reduced as much as possible. Therefore, how to improve the data transmission reliability, shorten the transmission latency, and reduce the signaling overheads, to reduce the power consumption becomes a problem that urgently needs to be resolved.
- 10 [0003] Currently, data may be transmitted through a semi-persistent scheduling (semi-persistent scheduling, SPS) physical downlink shared channel (physical downlink shared channel, PDSCH). However, sending of feedback information corresponding to the semi-persistent scheduling physical downlink shared channel (SPS PDSCH for short below) may be dropped (drop), and a network device does not know whether the SPS PDSCH is successfully received.
- 20 Therefore, if the network device directly retransmits the SPS PDSCH, a resource waste is caused, resulting in low transmission efficiency. If the network device does not retransmit the SPS PDSCH, a data loss is caused, resulting in low data transmission reliability.

SUMMARY

[0004] Embodiments of this application provide a communication method and a

communication apparatus, to resolve problems of low reliability and low transmission efficiency of data transmission performed through an SPS PDSCH, to improve communication efficiency.

[0005] To achieve the foregoing objective, this application uses the following technical solutions.

5 **[0006]** According to a first aspect, a communication method is provided. The communication method may be applied to a terminal device, and the communication method includes: determining a first uplink resource, where the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to a semi-persistent scheduling physical downlink shared channel; if time domain symbols (symbol)
10 occupied by the first uplink resource include a downlink symbol (downlink symbol) and/or a flexible symbol (flexible symbol) that is not indicated to be used for uplink transmission, determining a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink
15 resource is after a time domain start location of the first uplink resource; and sending the first feedback information on the second uplink resource.

[0007] According to the communication method in the first aspect, if sending of the first uplink resource is dropped, for example, the time domain symbols occupied by the first uplink resource include the downlink symbol and/or the flexible symbol that is not indicated to be used for uplink
20 transmission, the terminal device may determine the second time unit and the second uplink resource in a resource after the time domain start location of the first uplink resource, and send the first feedback information on the second uplink resource. In this way, when the feedback information corresponding to the SPS PDSCH is not sent on the first uplink resource, the terminal device may delay sending the feedback information on the second uplink resource. In this way, a
25 network device may determine, based on the feedback information, whether the SPS PDSCH is successfully received, and determine whether to retransmit the data, to reduce a data loss probability, improve data transmission reliability, to reduce a quantity of data retransmissions, save resources, improve transmission efficiency, thereby improving communication efficiency.

[0008] In a possible design, the second time unit may be located after the first time unit, or the
30 second time unit and the first time unit may be a same time unit. In this way, the terminal device may send the first feedback information in the first time unit, or may send the first feedback

information in a time unit after the first time unit, thereby improving flexibility of sending the first feedback information by the terminal device.

[0009] Optionally (manner 1 for short below), a relative location of the second uplink resource in the second time unit is the same as a relative location of the first uplink resource in the first time unit. In this way, a time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to some symbols in each time unit after the time domain start location of the first uplink resource. In other words, the terminal device may determine the second time unit and the second uplink resource in a relatively small time domain range, so that a calculation amount of the terminal device can be reduced, and power consumption can be reduced.

[0010] Alternatively, optionally (manner 2 for short below), a time domain width of the second uplink resource may be equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource may be equal to a frequency domain width of the first uplink resource. In other words, a size of the second uplink resource is equal to a size of the first uplink resource. In this way, a time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to a part of time domains after the time domain start location of the first uplink resource. The part of time domains are time domains including an available uplink resource. A size of the available uplink resource may be equal to a size of the first uplink resource. In other words, the terminal device may determine the second time unit and the second uplink resource in a relatively small time domain range, so that a calculation amount of the terminal device can be reduced, and power consumption can be reduced.

[0011] The foregoing manner 1 and manner 2 may be implemented independently or implemented in combination. A manner of combining manner 1 and manner 2 may include: the relative location of the second uplink resource in the second time unit is the same as the relative location of the first uplink resource in the first time unit, the time domain width of the second uplink resource is equal to the time domain width of the first uplink resource, and/or the frequency domain width of the second uplink resource is equal to the frequency domain width of the first uplink resource. In this way, the time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to some symbols in each of the time units in the foregoing part of time domains. In other words, the terminal

device may determine the second time unit and the second uplink resource in a smaller time domain range, so that a calculation amount of the terminal device can be reduced, and power consumption can be reduced.

[0012] In a possible design solution, the determining a second time unit and a second uplink

resource may include: determining the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition may be that an uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information; and determining the second uplink resource in the second time unit. In this way, when determining the second uplink resource in the second time unit, the terminal device may carry the first feedback information by using an available SPS feedback resource that already exists in the time unit, or carry the first feedback information by using a resource that already exists in the time unit and that carries an uplink signal. In other words, one feedback resource may be used to carry a plurality of pieces of feedback information, so that a quantity of interactions between the terminal device and the network device can be reduced, signaling overheads can be reduced, and communication efficiency can be improved.

[0013] Optionally, the determining the second uplink resource in the second time unit may

include: if the second time unit meets the first condition but does not meet the second condition, determining that an available SPS feedback resource in the second time unit is the second uplink resource; or if the second time unit meets the second condition, determining that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource. In this way, the first feedback information may be preferentially carried by using the existing resource carrying the uplink signal in the time unit. The resource carrying the uplink signal may be a dynamic feedback resource (for example, a feedback resource corresponding to a dynamically scheduled

PDSCH), and compared with the available SPS feedback resource, the dynamic feedback resource usually have better quality of a channel occupied by the dynamic feedback resource, and higher a feedback success rate. Therefore, the first feedback information is preferentially carried by using the resource carrying the uplink signal, so that data transmission reliability can be improved, and a transmission delay can be shortened, to improve communication efficiency.

[0014] Optionally, a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information. In other words, the available SPS feedback resource can carry the SPS feedback information in the candidate time unit, and can carry the first feedback information. Therefore, one new feedback resource can be used to carry a plurality of pieces of feedback information, thereby reducing a quantity of interactions between the terminal device and the network device, reducing signaling overheads, and improving communication efficiency.

[0015] In a possible design solution, after the determining a second time unit and a second uplink resource, the communication method according to the first aspect may further include: if a combination and sending condition is met, determining a third uplink resource, where the third uplink resource carries the first feedback information and second feedback information, where the combination and sending condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and sending the first feedback information and the second feedback information on the third uplink resource. In this way, one feedback resource may be used to carry a plurality of pieces of feedback information, to reduce a quantity of interactions between the terminal device and the network device and reduce signaling overheads. In addition, a resource conflict can be avoided in a resource multiplexing manner, and a quantity of times that sending of the first feedback information is dropped can be reduced. Therefore, data transmission reliability can be improved, a transmission delay can be shortened, and communication efficiency can be improved.

[0016] According to a second aspect, a communication method is provided. The

communication method may be applied to a network device, and the communication method includes: determining a first uplink resource, where the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH; if time domain symbols occupied by the first uplink resource include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determining a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and receiving the first feedback information on the second uplink resource.

[0017] In a possible design, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit.

[0018] Optionally, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit.

[0019] In a possible design solution, a time domain width of the second uplink resource may be equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource may be equal to a frequency domain width of the first uplink resource.

[0020] In a possible design solution, the determining a second time unit and a second uplink resource may include: determining the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition may be that an uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information; and determining the second uplink resource in the second time unit.

[0021] Optionally, the determining the second uplink resource in the second time unit may include: if the second time unit meets the first condition but does not meet the second condition, determining that an available SPS feedback resource in the second time unit is the second uplink resource; or if the second time unit meets the second condition, determining that a resource that is
5 in the second time unit and that carries the uplink signal is the second uplink resource.

[0022] Optionally, a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available
10 SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

[0023] In a possible design solution, the communication method according to the second aspect may further include: if a combination and receiving condition is met, determining a third
15 uplink resource, where the third uplink resource carries the first feedback information and second feedback information, where the combination and receiving condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and receiving the first feedback information and the second feedback information on the third uplink resource.

[0024] In addition, for a technical effect of the communication method according to the second aspect, refer to the technical effect of the communication method according to the first aspect. Details are not described herein again.

[0025] According to a third aspect, a communication apparatus is provided. The communication apparatus includes a processing module and a transceiver module. The processing
25 module is configured to determine a first uplink resource, where the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH; the processing module is further configured to: if time domain symbols occupied by the first uplink resource include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine
30 a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols

used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and the transceiver module is configured to send the first feedback information on the second uplink resource.

[0026] In a possible design, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit.

[0027] Optionally, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit.

[0028] Alternatively, optionally, a time domain width of the second uplink resource may be equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource may be equal to a frequency domain width of the first uplink resource.

[0029] In a possible design solution, the processing module may be further configured to determine the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition may be that an uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information. The processing module may be further configured to determine the second uplink resource in the second time unit.

[0030] Optionally, the processing module may be further configured to: if the second time unit meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource. Alternatively, the processing module may be further configured to: if the second time unit meets the second condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

[0031] Optionally, a codebook bit interval corresponding to an available SPS feedback

resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

[0032] In a possible design solution, the processing module is further configured to: if a combination and sending condition is met, determine a third uplink resource, and the third uplink resource carries the first feedback information and second feedback information, where the combination and sending condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and the transceiver module may be further configured to send the first feedback information and the second feedback information on the third uplink resource.

[0033] Optionally, the transceiver module may include a receiving module and a sending module. The sending module is configured to implement a sending function of the communication apparatus, and the receiving module is configured to implement a receiving function of the communication apparatus.

[0034] Optionally, the communication apparatus according to the third aspect may further include a storage module. The storage module stores a program or instructions. When the processing module executes the program or the instructions, the communication apparatus can perform the communication method according to the first aspect.

[0035] It should be noted that, the communication apparatus according to the third aspect may be a terminal device, a chip (system) or another part or component that may be disposed on the terminal device, or an apparatus that includes the terminal device. This is not limited in this application.

[0036] In addition, for a technical effect of the communication apparatus in the third aspect, refer to the technical effect of the communication method in the first aspect. Details are not described herein again.

[0037] According to a fourth aspect, a communication apparatus is provided. The communication apparatus includes a processing module and a transceiver module. The processing module is configured to determine a first uplink resource, where the first uplink resource is located

in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH; the processing module is further configured to: if time domain symbols occupied by the first uplink resource include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine
5 a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and the transceiver module is configured to receive the first feedback information on the second uplink resource.

10 **[0038]** In a possible design, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit.

[0039] Optionally, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit.

[0040] Alternatively, optionally, a time domain width of the second uplink resource may be
15 equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource may be equal to a frequency domain width of the first uplink resource.

[0041] In a possible design solution, the processing module may be further configured to determine the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of
20 each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than
25 or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition may be that an uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information. The processing module may be further configured to determine the second uplink resource in the
30 second time unit.

[0042] Optionally, the processing module may be further configured to: if the second time unit

meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource. Alternatively, the processing module may be further configured to: if the second time unit meets the second condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

[0043] Optionally, a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of the SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

[0044] In a possible design solution, the processing module is further configured to: if a combination and receiving condition is met, determine a third uplink resource, and the third uplink resource carries the first feedback information and second feedback information, where the combination and receiving condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and the transceiver module may be further configured to receive the first feedback information and the second feedback information on the third uplink resource.

[0045] Optionally, the transceiver module may include a receiving module and a sending module. The sending module is configured to implement a sending function of the communication apparatus, and the receiving module is configured to implement a receiving function of the communication apparatus.

[0046] Optionally, the communication apparatus according to the fourth aspect may further include a storage module. The storage module stores a program or instructions. When the processing module executes the program or the instructions, the communication apparatus can perform the communication method according to the second aspect.

[0047] It should be noted that the communication apparatus according to the fourth aspect may be a network device (for example, an access network device or a core network device), or may be a chip (system) or another part or component that may be disposed on the network device, or may be an apparatus including the network device. This is not limited in this application.

[0048] In addition, for a technical effect of the communication apparatus in the fourth aspect, refer to the technical effect of the communication method in the second aspect. Details are not described herein again.

[0049] According to a fifth aspect, a communication apparatus is provided. The communication apparatus is configured to perform the communication method according to any one of the implementations of the first aspect and the second aspect.

[0050] In this application, the communication apparatus according to the fifth aspect may be the terminal device according to the first aspect or the network device according to the second aspect, or a chip (system) or another part or component that may be disposed in the terminal device or the network device, or an apparatus that includes the terminal device or the network device.

[0051] It should be understood that the communication apparatus according to the fifth aspect includes a corresponding module, unit, or means (means) for implementing the communication method according to any one of the first aspect and the second aspect. The module, unit, or means may be implemented by hardware, or may be implemented by software, or may be implemented by hardware executing corresponding software. The hardware or software includes one or more modules or units configured to perform functions related to the foregoing communication method.

[0052] In addition, for a technical effect of the communication apparatus according to the fifth aspect, refer to the technical effect of the communication method according to any one of the first aspect and the second aspect. Details are not described herein again.

[0053] According to a sixth aspect, a communication apparatus is provided. The communication apparatus includes a processor, and the processor is configured to perform the communication method according to any one of the possible implementations of the first aspect and the second aspect.

[0054] In a possible design solution, the communication apparatus according to the sixth aspect may further include a transceiver. The transceiver may be a transceiver circuit or an interface circuit. The transceiver may be used by the communication apparatus according to the sixth aspect to communicate with another communication apparatus.

[0055] In a possible design, the communication apparatus according to the sixth aspect may further include a memory. The memory and the processor may be integrated together, or may be disposed separately. The memory may be configured to store a computer program and/or data related to the communication method according to any one of the first aspect and the second aspect.

[0056] In this application, the communication apparatus according to the sixth aspect may be the terminal device according to the first aspect or the network device according to the second aspect, or a chip (system) or another part or component that may be disposed in the terminal device or the network device, or an apparatus that includes the terminal device or the network device.

5 **[0057]** In addition, for a technical effect of the communication apparatus according to the sixth aspect, refer to the technical effect of the communication method according to any one of implementations of the first aspect and the second aspect. Details are not described herein again.

[0058] According to a seventh aspect, a communication apparatus is provided. The communication apparatus includes a processor. The processor is coupled to a memory, and the
10 processor is configured to execute a computer program stored in the memory, to enable the communication apparatus to perform the communication method according to any one of the possible implementations of the first aspect and the second aspect.

[0059] In a possible design solution, the communication apparatus in the seventh aspect may further include a transceiver. The transceiver may be a transceiver circuit or an interface circuit.
15 The transceiver may be used by the communication apparatus according to the seventh aspect to communicate with another communication apparatus.

[0060] In this application, the communication apparatus according to the seventh aspect may be the terminal device according to the first aspect or the network device according to the second aspect, or a chip (system) or another part or component that may be disposed in the terminal device
20 or the network device, or an apparatus that includes the terminal device or the network device.

[0061] In addition, for a technical effect of the communication apparatus according to the seventh aspect, refer to the technical effect of the communication method according to any one of implementations of the first aspect and the second aspect. Details are not described herein again.

[0062] According to an eighth aspect, a communication apparatus is provided. The
25 communication apparatus includes a processor and an interface circuit. The interface circuit is configured to receive code instructions and transmit the code instructions to the processor. The processor is configured to run the foregoing code instructions to perform the communication method according to any one of the implementations of the first aspect and the second aspect.

[0063] In a possible design, the communication apparatus according to the eighth aspect may
30 further include a memory. The memory and the processor may be integrated together, or may be disposed separately. The memory may be configured to store a computer program and/or data

related to the communication method according to any one of the first aspect and the second aspect.

[0064] In this application, the communication apparatus according to the eighth aspect may be the terminal device according to the first aspect or the network device according to the second aspect, or a chip (system) or another part or component that may be disposed in the terminal device or the network device, or an apparatus that includes the terminal device or the network device.

[0065] In addition, for a technical effect of the communication apparatus according to the eighth aspect, refer to the technical effect of the communication method according to any one of implementations of the first aspect and the second aspect. Details are not described herein again.

[0066] According to a ninth aspect, a communication apparatus is provided. The communication apparatus includes a processor and a transceiver, where the transceiver is configured to implement information exchange between the communication apparatus and another communication apparatus, and the processor executes program instructions to perform the communication method according to any one of the implementations of the first aspect and the second aspect.

[0067] In a possible design, the communication apparatus according to the ninth aspect may further include a memory. The memory and the processor may be integrated together, or may be disposed separately. The memory may be configured to store a computer program and/or data related to the communication method according to any one of the first aspect and the second aspect.

[0068] In this application, the communication apparatus according to the ninth aspect may be the terminal device according to the first aspect or the network device according to the second aspect, or a chip (system) or another part or component that may be disposed in the terminal device or the network device, or an apparatus that includes the terminal device or the network device.

[0069] In addition, for a technical effect of the communication apparatus according to the ninth aspect, refer to the technical effect of the communication method according to any one of implementations of the first aspect and the second aspect. Details are not described herein again.

[0070] According to a tenth aspect, a processor is provided. The processor is configured to perform the communication method according to any one of the possible implementations of the first aspect and the second aspect.

[0071] According to an eleventh aspect, a communication system is provided. The communication system includes one or more terminal devices and one or more network devices.

[0072] According to a twelfth aspect, a computer-readable storage medium is provided,

including a computer program or instructions. When the computer program or the instructions are run on a computer, the computer is enabled to perform the communication method according to any possible implementation of the first aspect and the second aspect.

[0073] According to a thirteenth aspect, a computer program product is provided. The computer program product includes a computer program or instructions. When the computer program or the instructions are run on a computer, the computer is enabled to perform the communication method according to any possible implementation of the first aspect and the second aspect.

BRIEF DESCRIPTION OF DRAWINGS

[0074] FIG. 1 is a schematic diagram 1 of time domain in which an SPS PDSCH transmits data according to an embodiment of this application;

[0075] FIG. 2 is a schematic diagram of resource multiplexing according to an embodiment of this application;

[0076] FIG. 3 is a schematic diagram of an architecture of a communication system to which a communication method is applicable according to an embodiment of this application;

[0077] FIG. 4 is a schematic flowchart of a communication method according to an embodiment of this application;

[0078] FIG. 5 is a schematic diagram 2 of time domain in which an SPS PDSCH transmits data according to an embodiment of this application;

[0079] FIG. 6 is a schematic diagram 3 of time domain in which an SPS PDSCH transmits data according to an embodiment of this application;

[0080] FIG. 7 is a schematic diagram 4 of time domain in which an SPS PDSCH transmits data according to an embodiment of this application;

[0081] FIG. 8 is a schematic diagram 5 of time domain in which an SPS PDSCH transmits data according to an embodiment of this application;

[0082] FIG. 9 is a schematic diagram 1 of a structure of a communication apparatus according to an embodiment of this application; and

[0083] FIG. 10 is a schematic diagram 2 of a structure of a communication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[0084] First, technical terms that may be used are briefly described in embodiments of this application.

[0085] 1. Slot (slot)

5 **[0086]** There are a plurality of time units in 5G new radio (new radio, NR), including a frame (frame), a subframe (subframe), a slot, and a symbol (symbol). A time length of one frame is 10 milliseconds (millisecond, ms) and includes 10 subframes. A time length of each subframe may be 1 ms, and one subframe may include one or more slots. One slot includes 12 symbols in a case of an extended cyclic prefix (extended cyclic prefix, ECP), or includes 14 symbols in a case of a
10 normal cyclic prefix (normal cyclic prefix, NCP). Symbols are classified into an uplink symbol (uplink symbol), a downlink symbol (downlink symbol), and a flexible symbol (flexible symbol). The symbol herein may be an orthogonal frequency division multiplexing (orthogonal frequency division multiplexing, OFDM) symbol.

[0087] NR supports flexible configuration of a frame structure. To be specific, in a slot, which
15 symbols are uplink symbols, which symbols are downlink symbols, and which symbol are flexible symbols may be flexibly configured. A configuration manner may include: a semi-persistent configuration manner or a dynamic (dynamic) configuration manner. In the semi-persistent configuration manner, an uplink symbol is referred to as a semi-persistent uplink symbol, a downlink symbol is referred to as a semi-persistent downlink symbol, and a flexible symbol is
20 referred to as a semi-persistent flexible symbol. In the dynamic configuration manner, an uplink symbol is referred to as a dynamic uplink symbol, a downlink symbol is referred to as a dynamic downlink symbol, and a flexible symbol is referred to as a dynamic flexible symbol. In addition, for a specific implementation process of the semi-persistent configuration and the dynamic configuration, refer to a specification in the conventional technology. Details are not described
25 herein.

[0088] A flexible symbol may be modified to an uplink symbol or a downlink symbol. A flexible symbol that is modified to an uplink symbol may be referred to as a flexible symbol indicated to be used for uplink transmission, and a flexible symbol that is modified to a downlink symbol may be referred to as a flexible symbol indicated to be used for downlink transmission.
30 For a specific implementation process in which the flexible symbol is modified to an uplink symbol

or a downlink symbol, refer to a specification in the conventional technology. Details are not described herein again.

[0089] The uplink symbol or the flexible symbol indicated to be used for uplink transmission may be used for uplink transmission, and the downlink symbol or the flexible symbol indicated to be used for downlink transmission may be used for downlink transmission. In other words, a downlink symbol, and/or, a flexible symbol that is not indicated to be used for uplink transmission cannot be used for uplink transmission. The flexible symbol that is not indicated to be used for uplink transmission includes a dynamic flexible symbol, a semi-persistent flexible symbol, and a flexible symbol that is indicated to be used for downlink transmission.

[0090] 2. SPS PDSCH

[0091] Data may be transmitted between a network device and a terminal device by using an SPS PDSCH. Specific steps are as follows:

[0092] Step 1: The network device sends configuration information to the terminal device, and the terminal device receives the configuration information from the network device.

[0093] The configuration information indicates an SPS PDSCH transmission period, a resource carrying feedback information corresponding to the SPS PDSCH, and the like. The feedback information corresponding to the SPS PDSCH herein is acknowledgement (acknowledgement, ACK) information or negative acknowledgement (negative acknowledgement, NACK) information of the SPS PDSCH, and the feedback information corresponding to the SPS PDSCH may be included in a hybrid automatic repeat request acknowledgement (hybrid automatic repeat request acknowledgement, HARQ-ACK) codebook. The resource carrying the feedback information corresponding to the SPS PDSCH may be a physical uplink control channel (physical uplink control channel, PUCCH). In addition, the feedback information corresponding to the SPS PDSCH may be referred to as SPS feedback information, and the resource carrying the feedback information corresponding to the SPS PDSCH may also be referred to as an SPS feedback resource.

[0094] Step 2: The network device sends activation information to the terminal device, and the terminal device receives the activation information from the network device.

[0095] The activation information may indicate a time domain location at which the SPS PDSCH is located and a time domain location at which the feedback information of the SPS PDSCH is located. In addition, the activation information may be carried on a physical downlink control channel (physical downlink control channel, PDCCH).

[0096] Specifically, the activation information may be implemented by using DCI, and an implementation is as follows:

[0097] The DCI indicates an index (index) value in a time domain resource table, to indicate the time domain location at which the SPS PDSCH is located. For example, refer to Table 1. Table 1 is a table of a correspondence between an index value, K0, and (S, L), namely, a time domain resource table. K0 represents a quantity of slots between a PDCCH carrying the DCI and the SPS PDSCH, and (S, L) represents that the SPS PDSCH is located from a symbol S to a symbol S+L in a slot. It is assumed that the DCI indicates that the index value in the time domain resource table is 1 (that is, K0=1, S=1, and L=2), and the PDCCH carrying the DCI is located in a slot n. In this case, an SPS PDSCH whose index value is 1 is located from a symbol 1 to a symbol 2 in a slot n+1.

Table 1

Index	K0	S+L
0	1	(2, 4)
1	1	(1, 2)
2	2	(3, 4)
3	2	(0, 7)

[0098] In addition, the time domain resource table may be predefined in a protocol, or may be configured by using higher layer signaling or physical layer signaling.

[0099] Specifically, the time domain location at which the feedback information of the SPS PDSCH is located may be indicated by using the DCI. For example, indication information is carried by using DCI, the indication information indicates a value of K1 in a K1 set, and the value of K1 indicates a quantity of slots between the SPS PDSCH and the feedback information of the SPS PDSCH. The K1 set may be a set configured by using higher layer signaling. As shown in FIG. 1, it is assumed that a first SPS PDSCH is in a slot 2, and K1=2. In this case, feedback information of the SPS PDSCH is located in a slot 4.

[00100] Step 3: The network device periodically sends an SPS PDSCH to the terminal device based on the SPS PDSCH transmission period and the activation information. The terminal device

periodically receives the SPS PDSCH from the network device based on the SPS PDSCH transmission period and the activation information.

[00101] Step 4: The terminal device determines feedback information corresponding to each SPS PDSCH, and periodically sends the feedback information to the network device based on the SPS PDSCH transmission period and the activation information. The network device periodically receives the feedback information from the terminal device based on the SPS PDSCH transmission period.

[00102] That the terminal device determines the feedback information corresponding to the SPS PDSCH may include: first determining a feedback time unit; then generating a HARQ-ACK codebook based on the feedback information corresponding to the SPS PDSCH; and finally determining a PUCCH resource carrying the HARQ-ACK codebook. As shown in FIG. 1, it is assumed that the SPS PDSCH is in a slot 2, and $K1=2$. In this case, it may be first determined that a feedback time unit is the slot 4, then a HARQ-ACK codebook is generated based on feedback information corresponding to the SPS PDSCH, and finally a PUCCH resource carrying the HARQ-ACK codebook is determined in a PUCCH set of the slot 4 based on a size of the HARQ-ACK codebook. Certainly, for a specific implementation in which the terminal device determines the feedback information corresponding to the SPS PDSCH, refer to a specification in the conventional technology. Details are not described herein again.

[00103] The following describes step 3 and step 4 with reference to FIG. 1.

[00104] As shown in FIG. 1, it is assumed that the SPS PDSCH transmission period is one slot, the DCI indicates index=1, $K1=2$, and the PDCCH carrying the DCI is located in a slot 1. In this case, the network device periodically sends the SPS PDSCH to the terminal device on a symbol 1 and a symbol 2 in the slot 2, a symbol 1 and a symbol 2 in a slot 3, and a symbol 1 and a symbol 2 in a slot n. Correspondingly, the terminal device separately periodically receives the SPS PDSCH from the network device on the symbol 1 and the symbol 2 in the slot 2, the symbol 1 and the symbol 2 in the slot 3, ..., and the symbol 1 and the symbol 2 in the slot n. Then, the terminal device separately periodically sends the feedback information to the network device in the slot 3, the slot 4, ..., and the slot n. Correspondingly, the network device separately periodically receives the feedback information from the terminal device in the slot 3, the slot 4, ..., and the slot n, where n is a positive integer.

[00105] In addition, the first SPS PDSCH may be referred to as an SPS PDSCH with scheduling

information, and each SPS PDSCH after the first SPS PDSCH may be referred to as an SPS PDSCH without scheduling information.

[00106] Based on step 1 to step 4, in a process of transmitting data between the network device and the terminal device by using the SPS PDSCH, after the configuration information and the activation information are determined, the terminal device may periodically receive a plurality of SPS PDSCHs, and may periodically send feedback information corresponding to the plurality of SPS PDSCHs to the network device.

[00107] The foregoing step 1 to step 4 is only an example for description. For a specific implementation of transmitting the data between the network device and the terminal device by using the semi-persistent scheduling physical downlink shared channel, refer to a corresponding specification in the conventional technology.

[00108] 3. Resource multiplexing

[00109] If feedback information corresponding to two data services exists in one time unit, or time domain resources carrying the feedback information corresponding to the two data services overlap, the terminal device may multiplex the feedback information corresponding to the two data services before sending the feedback information. As shown in FIG. 2, it is assumed that a HARQ-ACK codebook corresponding to a PDSCH 1 is sent on a PUCCH 1, a HARQ-ACK codebook corresponding to a PDSCH 2 is sent on a PUCCH 2, and the PUCCH 1 and the PUCCH 2 are located in a same slot. In this case, the two codebooks may be reassembled into a new codebook, and a new PUCCH is determined in the slot to carry the new codebook. For example, it is determined that a PUCCH 3 carries the HARQ-ACK codebook corresponding to the PDSCH 1 and the HARQ-ACK codebook corresponding to the PDSCH 2. A time domain location of the PUCCH 3, a time domain location of the PUCCH 1 and a time domain location of the PUCCH 2 may overlap, or may not overlap.

[00110] In a process of implementing embodiments of this application, an inventor of this application finds the following content:

[00111] When the data is transmitted between the network device and the terminal device by using the SPS PDSCH, both feedback information corresponding to the SPS PDSCH with scheduling information and feedback information corresponding to an SPS PDSCH without scheduling information is indicated by K1. In other words, a time domain location of feedback information corresponding to each SPS PDSCH without scheduling information is fixed. When

the following several cases occur, the feedback information corresponding to the SPS PDSCH without scheduling information is not sent:

[00112] Case 1: A resource carrying the feedback information corresponding to the SPS PDSCH is located in a semi-persistent downlink symbol.

5 **[00113]** Case 2: A resource carrying the feedback information corresponding to the SPS PDSCH is located in a dynamic downlink symbol.

[00114] Case 3: A resource carrying the feedback information corresponding to the SPS PDSCH is located in a flexible symbol that is not indicated to be used for uplink transmission.

[00115] In other words, if a resource carrying the feedback information corresponding to the
10 SPS PDSCH without scheduling information is located in a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, the feedback information corresponding to the SPS PDSCH without scheduling information is not sent. When the feedback information corresponding to the SPS PDSCH without scheduling information is not sent, the network device does not know whether the SPS PDSCH is successfully received. Therefore, if the
15 network device retransmits the SPS PDSCH, a resource is wasted, resulting in low transmission efficiency. If the network device does not retransmit the SPS PDSCH, a data loss is caused, resulting in low data transmission reliability.

[00116] In addition, during actual application, the foregoing case 1 to case 3 frequently occur, that is, the feedback information corresponding to the SPS PDSCH without scheduling information
20 is not frequently sent. Consequently, the network device frequently retransmits data, resulting in a high packet loss rate, low data transmission reliability, and a long transmission delay.

[00117] To resolve the foregoing technical problem, embodiments of this application provide a communication method and a communication apparatus, to improve data transmission reliability, shorten a transmission delay, and improve communication system performance. It should be noted
25 that the foregoing defects are all results of careful practical research by the inventor. Therefore, the discovery process of the foregoing problem and the solution provided for the foregoing problem in the following embodiments of this application should be considered as a contribution made by the inventor in the process of implementing this application.

[00118] The following describes technical solutions of this application with reference to
30 accompanying drawings.

[00119] The technical solutions in embodiments of this application may be applied to various

communication systems, for example, a wireless fidelity (wireless fidelity, Wi-Fi) system, a vehicle-to-everything (vehicle-to-everything, V2X) communication system, a device-to-device (device-to-device, D2D) communication system, an internet of vehicles communication system, a 4th generation (4th generation, 4G) mobile communication system such as 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) mobile communication system such as a new radio (new radio, NR) system, and a future communication system such as a 6th generation (6th generation, 6G) mobile communication system.

[00120] All aspects, embodiments, or features are presented in this application by describing a system that may include a plurality of devices, components, modules, and the like. It should be appreciated and understood that, each system may include another device, component, module, and the like, and/or may not include all devices, components, modules, and the like discussed with reference to the accompanying drawings. In addition, a combination of these solutions may be used.

[00121] In addition, in embodiments of this application, terms such as "example" and "for example" are used to represent giving an example, an illustration, or a description. Any embodiment or design scheme described as an "example" in this application should not be explained as being more preferred or having more advantages than another embodiment or design scheme. Specifically, the term "example" is used to present a concept in a specific manner.

[00122] In embodiments of this application, terms "information (information)", "signal (signal)", "message (message)", "channel (channel)", and "signaling (signaling)" may sometimes be interchangeably used. It should be noted that meanings expressed by the terms are consistent when differences of the terms are not emphasized. Terms "of (of)", "corresponding (corresponding, relevant)", and "corresponding (corresponding)" may be interchangeably used sometimes. It should be noted that meanings expressed by the terms are consistent when differences of the terms are not emphasized.

[00123] In embodiments of this application, a subscript, for example, W_1 , may sometimes be written in an incorrect form, for example, W1. Expressed meanings are consistent when differences are not emphasized.

[00124] The network architecture and the 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 the evolution of the network architecture and the emergence of new service scenarios, the technical solutions provided in embodiments of this application are also applicable to similar technical problems.

[00125] For ease of understanding embodiments of this application, a communication system shown in FIG. 3 is first used as an example to describe in detail a communication system applicable to embodiments of this application. For example, FIG. 3 is a schematic diagram of an architecture of a communication system to which a communication method according to an embodiment of this application.

[00126] As shown in FIG. 3, the communication system includes a network device and a terminal device.

[00127] The network device is a device that is located on a network side of the communication system and that has a wireless transceiver function, or a chip or a chip system that can be disposed in the device. The network device includes but is not limited to: an access point (access point, AP) in a wireless fidelity (wireless fidelity, Wi-Fi) system, such as a home gateway, a router, a server, a switch, and a bridge, an evolved NodeB (evolved NodeB, eNB), a radio network controller (radio network controller, RNC), a NodeB (NodeB, NB), a base station controller (base station controller, BSC), a base transceiver station (base transceiver station, BTS), a home NodeB (for example, a home evolved NodeB, or a home NodeB, HNB), a baseband unit (baseband unit, BBU), a wireless relay node, a wireless backhaul node, a transmission point (transmission and reception point, TRP; or transmission point, TP), or the like. The network device may alternatively be a gNB or a transmission point (TRP or TP) in a 5G system, for example, a new radio (new radio, NR) system, or one antenna panel or a group of antenna panels (including a plurality of antenna panels) of a base station in a 5G system. The network device may alternatively be a network node, such as a baseband unit (BBU), a distributed unit (distributed unit, DU), or a road side unit (road side unit, RSU) having a base station function, that constitutes a gNB or a transmission point.

[00128] The terminal device is a terminal accessing the communication system and having wireless sending and receiving functions, or a chip or a chip system that can be disposed in the terminal. The terminal device may also be referred to as a user apparatus, an access terminal, a subscriber unit, a subscriber station, a mobile station, a remote station, a remote terminal, a mobile

device, a user terminal, a terminal, a wireless communication device, a user agent, or a user apparatus. The terminal device in embodiments of this application may be a mobile phone (mobile phone), a tablet computer (Pad), a computer having wireless sending and receiving functions, a virtual reality (virtual reality, VR) terminal device, an augmented reality (augmented reality, AR) terminal device, a wireless terminal in industrial control (industrial control), a wireless terminal in self-driving (self-driving), a wireless terminal in remote medical (remote medical), a wireless terminal in a smart grid (smart grid), a wireless terminal in transportation safety (transportation safety), a wireless terminal in a smart city (smart city), a wireless terminal in a smart home (smart home), a vehicle-mounted terminal, an RSU that has a terminal function, or the like. The terminal device in this application may alternatively be a vehicle-mounted module, a vehicle-mounted assembly, a vehicle-mounted component, a vehicle-mounted chip, or a vehicle-mounted unit that is built in a vehicle as one or more components or units. The vehicle uses the vehicle-mounted module, the vehicle-mounted assembly, the vehicle-mounted component, the vehicle-mounted chip, or the vehicle-mounted unit that is built in the vehicle, to implement the communication method provided in embodiments of this application.

[00129] It should be noted that the communication method provided in this embodiment of this application may be applied to the terminal device and the network device shown in FIG. 3. For specific implementation, refer to the following method embodiment. Details are not described herein.

[00130] It should be noted that, the solutions in embodiments of this application may also be used in another communication system, and a corresponding name may also be replaced with a name of a corresponding function in the another communication system.

[00131] It should be understood that FIG. 3 is only a simplified schematic diagram of an example of the communication system for ease of understanding. The communication system may further include another network device and/or another terminal device that are/is not shown in FIG. 3.

[00132] The following describes in detail a communication method provided in embodiments of this application with reference to FIG. 4 to FIG. 8.

[00133] For example, FIG. 4 is a schematic flowchart 1 of a communication method according to an embodiment of this application. The communication method is applicable to communication between the terminal device and the network device shown in FIG. 3.

[00134] As shown in FIG. 4, the communication method may include the following steps.

[00135] S401: A terminal device determines a first uplink resource.

[00136] The first uplink resource may be located in a first time unit and may carry first feedback information, and the first feedback information may be feedback information corresponding to an

5 SPS PDSCH.

[00137] Optionally, the first feedback information may include feedback information corresponding to one or more SPS PDSCHs. When the first feedback information includes feedback information corresponding to a plurality of SPS PDSCHs, the configuration information of the plurality of SPS PDSCHs herein may be same or may be different. In addition, the first time
10 unit may be a slot.

[00138] The following uses an example in which the first feedback information includes feedback information corresponding to one SPS PDSCH, and describes S401 with reference to FIG. 5.

[00139] Refer to FIG. 5. It is assumed that the SPS PDSCH is located in a slot 1, and the
15 feedback information corresponding to the SPS PDSCH is carried on a PUCCH 1 (shown in a dashed-line box in FIG. 5) in a slot 3. A terminal device may determine that the PUCCH 1 is a first uplink resource, and the slot 3 is a first time unit. For descriptions of the SPS PDSCH and the feedback information corresponding to the SPS PDSCH, refer to step 1 to step 4. Details are not described herein again.

20 **[00140]** S402: If time domain symbols occupied by the first uplink resource include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, the terminal device determines a second time unit and a second uplink resource.

[00141] The second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time
25 domain start location of the second uplink resource may be after a time domain start location of the first uplink resource.

[00142] The second uplink resource may include a PUCCH, a physical uplink shared channel (physical uplink shared channel, PUSCH), or the like. The second time unit may be a slot. A time domain start location of a resource may be a first symbol in all time domain symbols occupied by
30 the resource. In addition, for the downlink symbol and the flexible symbol that is not indicated to be used for uplink transmission, refer to descriptions in the technical term 1. Details are not

described herein again.

[00143] S402 is described below with reference to FIG. 5.

[00144] Still refer to FIG. 5. Time domain symbols occupied by the PUCCH 1 (the first uplink resource) are a symbol 1 to a symbol 3 in the slot 3, and the three symbols are all downlink symbols.

5 In other words, time domain symbols occupied by the first uplink resource are all downlink symbols. To successfully send the PUCCH 1, the terminal device may determine the second time unit and the second uplink resource in a resource after the symbol 1 in the slot 3. For example, the slot 3 may be determined as the second time unit, and a PUCCH 2 may be determined as the second uplink resource. Alternatively, a slot 4 may be determined as the second time unit, and a PUCCH 3 may be determined as the second uplink resource. Time domain symbols occupied by the PUCCH 2 are a symbol 11 to a symbol 13 in the slot 3, and the three symbols are all uplink symbols. Time domain symbols occupied by the PUCCH 3 are a symbol 1 to a symbol 3 in the slot 4, and the three symbols are all uplink symbols.

[00145] In some possible embodiments, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit. For example, if the slot 4 is determined as the second time unit, and the PUCCH 3 is determined as the second uplink resource, the second time unit is located after the first time unit. In some other possible embodiments, if the slot 3 is determined as the second time unit, and the PUCCH 2 is determined as the second uplink resource, the second time unit and the first time unit are a same time unit.

20 **[00146]** In this way, the terminal device may send the first feedback information in the first time unit, or may send the first feedback information in a time unit after the first time unit, thereby improving flexibility of sending the first feedback information by the terminal device.

[00147] Optionally, to reduce a calculation amount of the terminal device and reduce power consumption, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit (referred to as a manner 1). The relative location may be a symbol number of a first symbol occupied by the resource in one slot, that is, a quantity of symbols between the first symbol and a symbol 0 of the slot. For example, it is assumed that one slot includes 14 symbols, which are respectively a symbol 0, a symbol 1, ..., and a symbol 13 in a time sequence, and one PUCCH in the slot is located in the symbol 1 to the symbol 3. In this case, a relative location of the PUCCH in the slot is 1.

30 **[00148]** Still refer to FIG. 5. Because the time domain start location of the PUCCH 1 is the

symbol 1 in the slot 3, when determining the second time unit and the second uplink resource, the terminal device may determine the second uplink resource by using the symbol 1 as a start symbol in a plurality of slots after the slot 3 in a time sequence. For example, the slot 4 may be determined as the second time unit, and the PUCCH 3 may be determined as the second uplink resource.

5 **[00149]** In this way, a time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to some symbols in each time unit after the time domain start location of the first uplink resource. In other words, the terminal device may determine the second time unit and the second uplink resource in a relatively small time domain range, so that a calculation amount of the terminal device can be
10 reduced, and power consumption can be reduced.

[00150] In some other possible embodiments, to reduce a calculation amount of the terminal device and reduce power consumption, a time domain width of the second uplink resource is equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource is equal to a frequency domain width of the first uplink resource (referred to as
15 manner 2).

[00151] Still refer to FIG. 5. Because time domain symbols occupied by the PUCCH 1 are the symbol 1 to the symbol 3 in the slot 3, when determining the second time unit and the second uplink resource, the terminal device may determine the second uplink resource in a symbol 1 to a symbol 3 in a plurality of slots after the slot 3 in a time sequence. For example, the PUCCH 3 may
20 be determined as the second uplink resource, and the slot 4 may be determined as the second time unit.

[00152] In this way, a time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to a part of time domains after the time domain start location of the first uplink resource. The part of time domains
25 are time domains including an available uplink resource. A size of the available uplink resource may be equal to a size of the first uplink resource. In other words, the terminal device may determine the second time unit and the second uplink resource in a relatively small time domain range, so that the calculation amount of the terminal device can be reduced, and the power consumption can be reduced.

30 **[00153]** Manner 1 and manner 2 may be independently implemented, or may be implemented in combination. To be specific, the relative location of the second uplink resource in the second

time unit is the same as the relative location of the first uplink resource in the first time unit, the time domain width of the second uplink resource is equal to the time domain width of the first uplink resource, and/or the frequency domain width of the second uplink resource is equal to the frequency domain width of the first uplink resource.

5 **[00154]** In this way, the time domain range of the second uplink resource may be reduced from all time domains after the time domain start location of the first uplink resource to some symbols in each of the time units in the foregoing part of time domains. In other words, the terminal device may determine the second time unit and the second uplink resource in a smaller time domain range, so that the calculation amount of the terminal device can be reduced, and the power consumption
10 can be reduced.

[00155] In some possible embodiments, S402 may include the following several implementations:

[00156] Manner 3 may include the following several steps:

[00157] Step 5: Determine the second time unit.

15 **[00158]** The second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition.

[00159] The first condition may be that: An available SPS feedback resource exists, all time
20 domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information. In other words, the available
25 SPS feedback resource can carry the SPS feedback information in the candidate time unit and the first feedback information.

[00160] The SPS feedback information in the candidate time unit may be feedback information corresponding to some or all SPS PDSCHs in the candidate time unit. For example, refer to FIG. 6. If a slot 4 is a candidate time unit, and the slot 4 includes SPS feedback information 1, SPS
30 feedback information 2, SPS feedback information 3, and SPS feedback information 4, some or all of the four pieces of feedback information may be selected as SPS feedback information in the

slot 4.

[00161] The foregoing second condition may be that: An uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information. A resource carrying the uplink data may be a PUSCH, a PUCCH, or the like. The dynamic feedback information may be feedback information corresponding to a dynamic PDSCH.

[00162] In addition, for the SPS feedback information and the available SPS feedback resource, refer to descriptions of the "SPS PDSCH" in the technical term 2. For specific description of feedback information corresponding to the dynamic PDSCH, refer to an existing implementation. Details are not described herein again.

[00163] Based on the foregoing description, the candidate time unit may alternatively be a time unit in which an available SPS feedback resource and/or an uplink signal exist/exists, and of which a time domain start location is not earlier than the time domain start location of the first time unit. In addition, if the "available SPS feedback resource and/or the uplink signal" exists in the first time unit, and the time domain start location of the "available SPS feedback resource and/or the uplink signal" is after the time domain start location of the first uplink resource, the first time unit may alternatively be a candidate time unit.

[00164] Optionally, that a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits may include: A codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information. In other words, the available SPS feedback resource can carry the SPS feedback information in the candidate time unit, and can carry the first feedback information. Therefore, one feedback resource can be used to carry a plurality of pieces of feedback information, thereby reducing a quantity of interactions between the terminal device and the network device, reducing signaling overheads, and improving communication efficiency.

[00165] Step 6: Determine the second uplink resource in the second time unit.

[00166] Optionally, after the second uplink resource is determined in the second time unit, it is

equivalent to that the first feedback information is delayed to be sent on the second uplink resource in the second time unit. In other words, SPS feedback information in the second time unit may include the first feedback information. In other words, in the second time unit determined by the terminal device, the SPS feedback information may include feedback information corresponding to another SPS PDSCH and the first feedback information. For example, refer to FIG. 6. If it is determined that the slot 4 is the second time unit, the SPS feedback information in the slot 4 includes the first feedback information and other SPS feedback information.

[00167] The following describes step 5 and step 6 with reference to FIG. 6.

[00168] Refer to FIG. 6. A slot 3 is a first time unit, a PUCCH 1 is a first uplink resource, an available SPS feedback resource and an uplink signal exist in a slot 4, an uplink signal exists in a slot 5, and an available SPS feedback resource exists in a slot 6. Therefore, the slot 4, the slot 5, and the slot 6 are all candidate time units. Because the slot 4 is a candidate time unit with an earliest time domain location in the several candidate time units, the slot 4 may be determined as the second time unit, and then the terminal device may determine the second uplink resource in the slot 4. For example, the terminal device may determine a resource that carries the uplink signal in the slot 4 as the second uplink resource. In other words, the first feedback information is carried by using the resource that carries the uplink signal in the slot 4.

[00169] In this way, when determining the second uplink resource in the second time unit, the terminal device may carry the first feedback information by using an available SPS feedback resource that already exists in the time unit, or carry the first feedback information by using a resource that already exists in the time unit and that carries an uplink signal. In other words, one feedback resource may be used to carry a plurality of pieces of feedback information, so that a quantity of interactions between the terminal device and the network device can be reduced, signaling overheads can be reduced, and communication efficiency can be improved.

[00170] Optionally, step 6, the determining the second uplink resource in the second time unit, may include: if the second time unit meets the first condition but does not meet the second condition, determining that an available SPS feedback resource in the second time unit is the second uplink resource; or if the second time unit meets the second condition, determining that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

[00171] In an implementation, the determining the available SPS feedback resource in the

second time unit as the second uplink resource in step 6 may include: first determining the SPS feedback information in the second time unit, then determining the available SPS feedback resource from a semi-persistent scheduling PUCCH resource set in the second time unit based on a sum of a payload (payload) size of the SPS feedback information and a payload size of the first feedback information; and finally determining the available SPS feedback resource as the second uplink resource.

[00172] The determining the available SPS feedback resource from a semi-persistent scheduling PUCCH resource set in the second time unit may include: determining one or more first available PUCCH resources from the semi-persistent scheduling PUCCH resource set in the second time unit, where each first available PUCCH resource meets the following condition: All occupied time domain symbols are symbols used for uplink transmission, and a maximum value of a corresponding codebook bit interval may be greater than or equal to the foregoing quantity of feedback bits. A first available PUCCH resource with a shortest frequency domain width and/or a shortest time domain width or an earliest time domain start location is determined, from the one or more first available PUCCH resources, as the available SPS feedback resource.

[00173] In an implementation, the determining that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource in step 6 may include: first determining dynamic feedback information in the second time unit; then combining the dynamic feedback information and the first feedback information into one piece of feedback information; then determining the resource carrying the uplink signal in a dynamic PUCCH resource set in the second time unit based on a payload size of the combined feedback information; and finally determining the resource carrying the uplink signal as the second uplink resource.

[00174] The determining the resource carrying the uplink signal in a dynamic PUCCH resource set in the second time unit may include: determining one or more second available PUCCH resources from the dynamic PUCCH resource set based on the payload size of combined feedback information and a physical uplink control channel resource indicator (PUCCH resource indicator, PRI) in DCI. Each second available PUCCH resource meets the following condition: All occupied time domain symbols are symbols used for uplink transmission, and a maximum value of a corresponding codebook bit interval may be greater than or equal to the foregoing quantity of feedback bits. A second available PUCCH resource with a shortest frequency domain width and/or a shortest time domain width or an earliest time domain start location is determined, from the one

or more second available PUCCH resources, as the resource carrying the uplink signal.

[00175] It can be learned from step 6 that the terminal device may preferentially carry the first feedback information by using the existing resource carrying the uplink signal in the time unit. The resource carrying the uplink signal may be a dynamic feedback resource (for example, a dynamic PDSCH). Compared with the available SPS feedback resource, the dynamic feedback resource may have a better condition of a channel occupied, and a higher feedback success rate. Therefore, the first feedback information is preferentially carried by using the resource carrying the uplink signal, so that data transmission reliability can be improved, and a transmission delay can be shortened, to improve communication efficiency.

[00176] Optionally, after step 5, step 6 may not be performed, but the following step 7 is performed, to determine the second uplink resource in the second time unit.

[00177] Step 7: Determine an available SPS feedback resource in the second time unit as a second uplink resource, or determine a resource carrying an uplink signal in the second time unit as a second uplink resource.

[00178] It can be learned by comparing two implementations of step 6 and step 7 that a difference between the two implementations lies in that: in step 6, the first feedback information may be preferentially carried by using an existing resource carrying the uplink signal in the time unit, while in step 7, the available SPS feedback resource or the resource carrying the uplink signal in the second time unit is determined as the second uplink resource. Therefore, an effect of step 7 includes: determining the available SPS feedback resource or the resource carrying the uplink signal in the second time unit as the second uplink resource, and using one feedback resource to carry a plurality of pieces of feedback information, so that a quantity of interactions between the terminal device and the network device can be reduced, signaling overheads can be reduced, and communication efficiency can be improved.

[00179] Manner 4: Determine the second time unit, and determine the second uplink resource in the second time unit.

[00180] The second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a candidate condition. The candidate condition may include any one of the following: an uplink symbol exists, feedback information exists, dynamic feedback information exists, or SPS

feedback information exists.

[00181] It can be learned by comparing the foregoing manner 3 and manner 4 that manner 4 and manner 3 may be replaced with each other. Therefore, for an implementation and an effect of manner 4, refer to manner 3. Details are not described herein again.

5 **[00182]** Manner 5: Determine a third time unit. The third time unit may be a time unit that is after the time domain start location of the first uplink resource and that includes an available uplink resource, and all time domain symbols occupied by the available uplink resource are symbols used for uplink transmission. The third time unit is determined as the second time unit, and the available uplink resource in the third time unit is determined as the second uplink resource.

10 **[00183]** The following describes how to implement manner 5 with reference to FIG. 5, FIG. 7, FIG. 8, and several examples.

[00184] Example 1: First, a size and a location of the second uplink resource are determined. The size of the second uplink resource is equal to the size of the first uplink resource, and the relative location of the second uplink resource in a time unit is the same as the relative location of
15 the first uplink resource in the first time unit. In addition, that a size of one resource is equal to a size of another resource may be: A time domain width of one resource is equal to a time domain width of the another resource, and/or a frequency domain width of one resource is equal to a frequency domain width of the another resource.

[00185] Then, the third time unit is determined based on the size and the location of the second
20 uplink resource. The third time unit may be a 1st time unit that is after the first time unit and that includes a third available uplink resource, where a size of the third available uplink resource is equal to the size of the first uplink resource, a location of the third available uplink resource in the third time unit is the same as a location of the first uplink resource in the first time unit, and all time domain symbols occupied by the third available uplink resource are symbols used for uplink
25 transmission.

[00186] Finally, the third time unit is determined as the second time unit, and the third available uplink resource in the third time unit is determined as the second uplink resource.

[00187] Refer to FIG. 5. The slot 3 is the first time unit, the PUCCH 1 is the first uplink resource, and the PUCCH 1 is located in the symbol 1 to the symbol 3 in the slot 3. The terminal device may
30 determine, in a time sequence starting from the slot 3, a first slot in which the third available uplink resource exists as the third time unit in a symbol 1 to a symbol 3 in each slot after the slot 3, for

example, the slot 4 in FIG. 5, then determine the slot 4 as the second time unit, and determine the PUCCH 3 in the symbol 1 to the symbol 3 in the slot 4 as the second uplink resource.

[00188] Example 2: First, a size of the second uplink resource is determined. A size of the second uplink resource is equal to a size of the first uplink resource.

5 **[00189]** Then, the third time unit is determined based on the size of the second uplink resource. The third time unit may be a 1st time unit that is after the first time unit and that includes a fourth available uplink resource, where a size of the fourth available uplink resource is equal to the size of the first uplink resource.

[00190] Finally, the third time unit is determined as the second time unit, and the fourth
10 available uplink resource in the third time unit is determined as the second uplink resource.

[00191] Refer to FIG. 7. A slot 3 is the first time unit, a PUCCH 1 is the first uplink resource, and the PUCCH 1 is located in a symbol 1 to a symbol 3 in the slot 3. The terminal device may determine, in a time sequence starting from the symbol 3 in the slot 3, a first slot in which the fourth available uplink resource exists as the third time unit in each symbol after the symbol 3 in
15 the slot 3, for example, the slot 3 in FIG. 7, then determine the slot 3 as the second time unit, and determine a PUCCH 2 in a symbol 11 to a symbol 13 in the slot 3 as the second uplink resource.

[00192] Example 3: First, a fifth available uplink resource is determined based on a size of the first uplink resource. The fifth available uplink resource may be an uplink resource after the first uplink resource in time domain, and a size of the fifth available uplink resource is greater than or
20 equal to the size of the first uplink resource.

[00193] Then, the fifth available uplink resource is determined as the second uplink resource, and a time unit in which the fifth available uplink resource is located is determined as the second time unit.

[00194] Refer to FIG. 8. A slot 3 is the first time unit, and a PUCCH 1 is the first uplink resource.
25 The terminal device may determine, in a time sequence starting from the slot 3, a first slot in which the fifth available uplink resource exists as the third time unit in a PUCCH resource set (including a PUCCH resource set 1, a PUCCH resource set 2, and a PUCCH resource set 3) in each slot after the slot 3, for example, a slot 4 in FIG. 8. Then, the slot 4 is determined as the second time unit, and a PUCCH 2 in the slot 4 is determined as the second uplink resource.

30 **[00195]** With reference to Example 1 to Example 3, it can be learned that Manner 5 provides a plurality of implementations of determining the second time unit and the second uplink resource,

and the feedback information may be sent on the second uplink resource, to avoid dropping of sending of the feedback information. In this way, the network device may determine, based on the feedback information, whether the SPS PDSCH is successfully received, and determine whether to retransmit the data, to reduce a data loss probability, improve data transmission reliability, reduce a quantity of data retransmissions, and improve transmission efficiency, thereby improving communication efficiency.

[00196] It can be learned with reference to manner 3 to manner 5 that the second time unit determined based on manner 3 to manner 5 may be located after the first time unit, or the second time unit and the first time unit may be a same time unit. The relative location that is of the second uplink resource in the second time unit and that is determined in manner 3 to manner 5 may be the same as the relative location of the first uplink resource in the first time unit.

[00197] In addition, the symbol used for uplink transmission may include one or more of the following: a semi-persistently configured uplink symbol, a dynamically indicated flexible symbol used for uplink transmission, a flexible symbol configured for uplink transmission, or the like.

[00198] In some possible embodiments, after S402, the communication method shown in FIG. 4 may further include the following step.

[00199] Step 8: If a combination and sending condition is met, determine a third uplink resource. The third uplink resource may carry the first feedback information and second feedback information.

[00200] The combination and sending condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap.

[00201] The second feedback information may be uplink data, for example, feedback information corresponding to an SPS PDSCH or feedback information corresponding to a dynamic PDSCH. When the second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap, the terminal device may determine, in a multiplexing manner, the third uplink resource to carry the first feedback information and the second feedback information. The third uplink resource herein may be the same as the second uplink resource, or may be different from the second uplink resource.

[00202] In this way, one feedback resource may be used to carry a plurality of pieces of feedback information, to reduce a quantity of interactions between the terminal device and the

network device and reduce signaling overheads. In addition, a resource conflict can be avoided in a resource multiplexing manner, and a quantity of times that sending of the first feedback information is dropped can be reduced. Therefore, data transmission reliability can be improved, a transmission delay can be shortened, and communication efficiency can be improved.

5 **[00203]** After performing step 8 of determining the third uplink resource, the terminal device may further send the first feedback information and the second feedback information on the third uplink resource.

[00204] In addition, for determining, by the terminal device, the second uplink resource in a multiplexing manner, refer to the foregoing technical term 3. Details are not described herein again.

10 **[00205]** S403: The terminal device sends the first feedback information on the second uplink resource, and the network device receives the first feedback information on the second uplink resource.

[00206] For an implementation in which the network device receives the first feedback information on the second uplink resource in S403, refer to S401 and S402. Details are not
15 described herein again.

[00207] After the network device receives the first feedback information, if the first feedback information includes acknowledgement information, the network device determines that the terminal device successfully receives the SPS PDSCH. If the first feedback information includes negative acknowledgement information, the network device determines that the terminal device
20 fails to receive the SPS PDSCH, and the network device may retransmit the SPS PDSCH to the terminal device.

[00208] According to the communication method shown in FIG. 4, if sending of the first uplink resource is dropped, for example, the time domain symbols occupied by the first uplink resource include the downlink symbol and/or the flexible symbol that is not indicated to be used for uplink
25 transmission, the terminal device may determine the second time unit and the second uplink resource in a resource after the time domain start location of the first uplink resource, and send the first feedback information on the second uplink resource. In this way, when the feedback information corresponding to the SPS PDSCH is not sent on the first uplink resource, the terminal device may delay the feedback information and send the feedback information on the second
30 uplink resource. In this way, the network device may determine, based on the feedback information, whether the SPS PDSCH is successfully received, and determine whether to retransmit the data,

to reduce a data loss probability, improve data transmission reliability, to reduce a quantity of data retransmissions, save resources, improve transmission efficiency, thereby improving communication efficiency.

[00209] The communication method provided in embodiments of this application is described above in detail with reference to FIG. 4 to FIG. 8. The following describes, in detail with reference to FIG. 9 to FIG. 10, communication apparatuses configured to perform the communication method provided in embodiments of this application.

[00210] For example, FIG. 9 is a schematic diagram 1 of a structure of a communication apparatus according to an embodiment of this application. As shown in FIG. 9, the communication apparatus 900 includes a processing module 901 and a transceiver module 902. For ease of description, FIG. 9 shows only main components of the communication apparatus.

[00211] In some embodiments, the communication apparatus 900 may be applicable to the communication system shown in FIG. 3, and perform a function of the terminal device in the communication method shown in FIG. 4.

[00212] The processing module 901 is configured to determine a first uplink resource, where the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH; the processing module 901 is further configured to: if time domain symbols occupied by the first uplink resource include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and the transceiver module 902 is configured to send the first feedback information on the second uplink resource.

[00213] In a possible design, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit.

[00214] Optionally, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit.

[00215] Alternatively, optionally, a time domain width of the second uplink resource may be equal to a time domain width of the first uplink resource, and/or a frequency domain width of the

second uplink resource may be equal to a frequency domain width of the first uplink resource.

[00216] In a possible design solution, the processing module 901 may be further configured to determine the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information. The second condition may be that: An uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information. The processing module 901 may be further configured to determine the second uplink resource in the second time unit.

[00217] Optionally, the processing module 901 may be further configured to: if the second time unit meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource. Alternatively, the processing module 901 may be further configured to: if the second time unit meets the second condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

[00218] Optionally, a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

[00219] In a possible design solution, the processing module 901 may be further configured to: if a combination and sending condition is met, determine a third uplink resource. The third uplink resource may carry the first feedback information and second feedback information. The

combination and sending condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap. The transceiver module 902 may be further configured to send the first feedback information and the second feedback information on the third uplink resource.

5 **[00220]** Optionally, the transceiver module 902 may include a receiving module and a sending module (not shown in FIG. 9). The sending module is configured to implement a sending function of the communication apparatus 900, and the receiving module is configured to implement a receiving function of the communication apparatus 900.

10 **[00221]** Optionally, the communication apparatus 900 may further include a storage module (not shown in FIG. 9). The storage module stores a program or instructions. When the processing module 901 executes the program or the instructions, the communication apparatus 900 can perform the functions of the terminal device in the communication method shown in FIG. 4.

15 **[00222]** It should be understood that, the processing module 901 in the communication apparatus 900 may be implemented by using a processor or a processor-related circuit component, and may be a processor or a processing unit. The transceiver module 902 may be implemented by using a transceiver or a transceiver-related circuit component, and may be a transceiver or a transceiver unit.

20 **[00223]** It should be noted that the communication apparatus 900 may be the terminal device shown in FIG. 3, or may be a chip (system) or another part or component disposed in the foregoing terminal device, or an apparatus that includes the terminal device. This is not limited in this application.

25 **[00224]** In addition, for a technical effect of the communication apparatus 900, refer to the technical effect of the communication method shown in FIG. 4. Details are not described herein again.

30 **[00225]** In some other embodiments, the communication apparatus 900 may be applicable to the communication system shown in FIG. 3, and perform a function of the network device in the communication method shown in FIG. 4.

30 **[00226]** The processing module 901 is configured to determine a first resource, where the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH; the processing module 901 is further configured to: if time domain symbols occupied by the first uplink resource

include a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine a second time unit and a second uplink resource, where the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and the transceiver module 902 is configured to receive the first feedback information on the second uplink resource.

[00227] In a possible design, the second time unit may be located after the first time unit, or the second time unit and the first time unit may be a same time unit.

[00228] Optionally, a relative location of the second uplink resource in the second time unit may be the same as a relative location of the first uplink resource in the first time unit.

[00229] Alternatively, optionally, a time domain width of the second uplink resource may be equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource may be equal to a frequency domain width of the first uplink resource.

[00230] In a possible design solution, the processing module 901 may be further configured to determine the second time unit, where the second time unit may be a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit may be not earlier than a time domain start location of the first time unit, and each candidate time unit may meet a first condition and/or a second condition, where the first condition may be that: An available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource may be greater than or equal to a quantity of feedback bits, and the quantity of feedback bits may be a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information. The second condition may be that: An uplink signal exists, and the uplink signal includes uplink data or dynamic feedback information. The processing module 901 may be further configured to determine the second uplink resource in the second time unit.

[00231] Optionally, the processing module 901 may be further configured to: if the second time unit meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource. Alternatively, the processing module 901 may be further configured to: if the second time unit meets the second

condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

[00232] Optionally, a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may include a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information, or a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit may be greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

[00233] In a possible design solution, the processing module 901 may be further configured to: if a combination and receiving condition is met, determine a third uplink resource. The third uplink resource may carry the first feedback information and second feedback information. The combination and receiving condition may be: The second time unit includes the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap. The transceiver module 902 may be further configured to receive the first feedback information and the second feedback information on the third uplink resource.

[00234] Optionally, the communication apparatus 900 may further include a storage module (not shown in FIG. 9). The storage module stores a program or instructions. When the processing module 901 executes the program or the instructions, the communication apparatus 900 can perform the functions of the network device in the communication method shown in FIG. 4.

[00235] It should be understood that, the processing module 901 in the communication apparatus 900 may be implemented by using a processor or a processor-related circuit component, and may be a processor or a processing unit. The transceiver module 902 may be implemented by using a transceiver or a transceiver-related circuit component, and may be a transceiver or a transceiver unit.

[00236] It should be noted that the communication apparatus 900 may be the network device shown in FIG. 3, or may be a chip (system) or another part or component disposed in the foregoing network device, or an apparatus that includes the network device. This is not limited in this application.

[00237] In addition, for a technical effect of the communication apparatus 900, refer to the technical effect of the communication method shown in FIG. 4. Details are not described herein

again.

[00238] For example, FIG. 10 is a schematic diagram 2 of a structure of a communication apparatus according to an embodiment of this application. The communication apparatus may be a terminal device or a network device, or may be a chip (system) or another component or assembly that may be disposed in the terminal device or the network device. As shown in FIG. 10, the communication apparatus 1000 includes a processor 1001. Optionally, the communication apparatus 1000 may further include a memory 1002 and/or a transceiver 1003. The processor 1001 is coupled to the memory 1002 and the transceiver 1003, for example, may be connected through a communication bus.

[00239] The following specifically describes each component of the communication apparatus 1000 with reference to FIG. 10.

[00240] The processor 1001 is a control center of the communication apparatus 1000, and may be one processor, or may be a collective name of a plurality of processing elements. For example, the processor 1001 is one or more central processing units (central processing units, CPUs), or may be an application-specific integrated circuit (application-specific integrated circuit, ASIC), or is configured as one or more integrated circuits for implementing embodiments of this application, for example, one or more processors (digital signal processors, DSPs) or one or more field programmable gate arrays (field programmable gate arrays, FPGAs).

[00241] Optionally, the processor 1001 may run or execute a software program stored in the memory 1002, and invoke data stored in the memory 1002, to perform various functions of the communication apparatus 1000.

[00242] During specific implementation, in an embodiment, the processor 1001 may include one or more CPUs, for example, a CPU 0 and a CPU 1 shown in FIG. 10.

[00243] During specific implementation, in an embodiment, the communication apparatus 1000 may include a plurality of processors, for example, the processor 1001 and a processor 1004 shown in FIG. 10. Each of the processors may be a single-core processor (single-CPU) or a multi-core processor (multi-CPU). The processor herein may be one or more devices, circuits, and/or processing cores configured to process data (for example, computer program instructions).

[00244] The memory 1002 is configured to store a software program for performing the solutions of this application, and the processor 1001 controls execution of the software program. For a specific implementation, refer to the foregoing method embodiments. Details are not

described herein again.

[00245] Optionally, the memory 1002 may be a read-only memory (read-only memory, ROM) or another type of static storage device that can store static information and instructions, or a random access memory (random access memory, RAM) or another type of dynamic storage device that can store information and instructions; or may be 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, an optical disc storage (including a compact optical disc, a laser disc, an optical disc, a digital versatile disc, a Blu-ray disc, or the like), a magnetic disk storage medium or another magnetic storage device, or any other medium that can be configured to carry or store expected program code in a form of instructions or a data structure and that can be accessed by a computer, but is not limited thereto. The memory 1002 may be integrated with the processor 1001, or may exist independently, and is coupled to the processor 1001 through an interface circuit (not shown in FIG. 10) of the communication apparatus 1000. This is not specifically limited in this embodiment of this application.

[00246] The transceiver 1003 is configured to communicate with another communication apparatus. For example, the communication apparatus 1000 is a terminal device, and the transceiver 1003 may be configured to communicate with a network device or communicate with another terminal device. For another example, the communication apparatus 1000 is a network device, and the transceiver 1003 may be configured to communicate with a terminal device or communicate with another network device.

[00247] Optionally, the transceiver 1003 may include a receiver and a transmitter (not separately shown in FIG. 10). The receiver is configured to implement a receiving function, and the transmitter is configured to implement a sending function.

[00248] Optionally, the memory 1002 may be integrated with the processor 1001, or may exist independently, and is coupled to the processor 1001 through an interface circuit (not shown in FIG. 10) of the communication apparatus 1000. This is not specifically limited in this embodiment of this application.

[00249] It should be noted that the structure of the communication apparatus 1000 shown in FIG. 10 does not constitute a limitation on the communication apparatus. An actual communication apparatus may include more or fewer components than those shown in the figure, or combine some

components, or use a different component deployment.

[00250] In addition, for a technical effect of the communication apparatus 1000, refer to the technical effect of the communication method in the foregoing method embodiments. Details are not described herein again.

5 **[00251]** An embodiment of this application provides a communication system. The communication system includes one or more terminal devices and one or more network devices.

[00252] It should be understood that, the processor in embodiments of this application may be a central processing unit (central processing unit, CPU), or may be another general-purpose processor, a digital signal processor (digital signal processor, DSP), an application-specific
10 integrated circuit (application-specific integrated circuit, ASIC), a field programmable gate array (field programmable gate array, FPGA), or another programmable logic device, discrete gate or transistor logic device, discrete hardware component, or the like. The general-purpose processor may be a microprocessor, or the processor may alternatively be any conventional processor or the like.

15 **[00253]** It may be understood that the memory in embodiments of this application may be a volatile memory or a nonvolatile memory, or may include a volatile memory and a nonvolatile memory. The nonvolatile memory may be a read-only memory (read-only memory, ROM), a programmable read-only memory (programmable ROM, PROM), an erasable programmable read-only memory (erasable PROM, EPROM), an electrically erasable programmable read-only
20 memory (electrically EPROM, EEPROM), or a flash memory. The volatile memory may be a random access memory (random access memory, RAM) that is used as an external cache. Through an example rather than a limitative description, random access memories (random access memory, RAM) in many forms may be used, for example, a static random access memory (static RAM, SRAM), a dynamic random access memory (dynamic random access memory, DRAM), a
25 synchronous dynamic random access memory (synchronous DRAM, SDRAM), a double data rate synchronous dynamic random access memory (double data rate SDRAM, DDR SDRAM), an enhanced synchronous dynamic random access memory (enhanced SDRAM, ESDRAM), a synchlink dynamic random access memory (synchlink DRAM, SLDRAM), and a direct rambus random access memory (direct rambus RAM, DR RAM).

30 **[00254]** All or some of the foregoing embodiments may be implemented using software, hardware (for example, circuit), firmware, or any combination thereof. When software is used to

implement embodiments, the foregoing embodiments may be implemented completely or partially in a form of a computer program product. The computer program product includes one or more computer instructions or computer programs. When the program instructions or the computer programs are loaded and executed on the computer, the procedure or functions according to
5 embodiments of this application are all or partially generated. The computer may be a general-purpose computer, a dedicated computer, a computer network, or another programmable apparatus. The computer instructions may be stored in a computer-readable storage medium or may be transmitted from a computer-readable storage medium to another computer-readable storage medium. For example, the computer instructions may be transmitted from a website, computer,
10 server, or data center to another website, computer, server, or data center in a wired (for example, infrared, radio, and microwave, or the like) manner. The computer-readable storage medium may be any usable medium accessible by a computer, or a data storage device, such as a server or a data center, integrating one or more usable media. The usable medium may be a magnetic medium (for example, a floppy disk, a hard disk, or a magnetic tape), an optical medium (for example, a DVD),
15 or a semiconductor medium. The semiconductor medium may be a solid-state drive.

[00255] It should be understood that the term "and/or" in this specification describes only an association relationship between associated objects, and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. A and B may be singular or plural. In addition, the character "/" in this
20 specification usually indicates an "or" relationship between the associated objects, but may also indicate an "and/or" relationship. For details, refer to the context for understanding.

[00256] In this application, "at least one" refers to one or more, and "a plurality of" refers to two or more. At least one of the following items (pieces) or a similar expression thereof refers to any combination of these items, including any combination of singular items (pieces) or plural
25 items (pieces). For example, at least one of a, b, or c may indicate: a, b, c, a-b, a-c, b-c, or a-b-c, where a, b, and c may be singular or plural.

[00257] It should be understood that, in various embodiments of this application, sequence numbers of the foregoing processes do not mean execution sequences. The execution sequences of the processes should be determined according to functions and internal logic of the processes,
30 and do not constitute any limitation on implementation processes of embodiments of this application.

[00258] A person of ordinary skill in the art may be aware that, in combination with examples described in embodiments disclosed in this specification, units and algorithm steps may be implemented by electronic hardware or a combination of computer software and electronic hardware. Whether the functions are performed by hardware or software depends on particular applications and design constraint conditions of the technical solutions. A person skilled in the art may use different methods to implement the described functions for each particular application, but it should not be considered that the implementation goes beyond the scope of this application.

[00259] It may be clearly understood by a person skilled in the art that, for the purpose of convenient and brief description, for a detailed working process of the foregoing system, apparatus, and unit, refer to a corresponding process in the foregoing method embodiments. Details are not described herein again.

[00260] In the several embodiments provided in this application, it should be understood that the disclosed system, apparatus, and method may be implemented in other manners. For example, the described apparatus embodiment is merely an example. For example, division into the units is merely logical function division and may be other division in actual implementation. For example, a plurality of units or components may be combined or integrated into another system, or some features may be ignored or not performed. In addition, the displayed or discussed mutual couplings or direct couplings or communication connections may be implemented through some interfaces. The indirect couplings or communication connections between the apparatuses or units may be implemented in electronic, mechanical, or other forms.

[00261] The units described as separate parts may or may not be physically separate, and parts displayed as units may or may not be physical units, may be located in one position, or may be distributed on a plurality of network units. Some or all of the units may be selected based on actual requirements to achieve the objectives of the solutions of embodiments.

[00262] In addition, functional units in the embodiments of this application may be integrated into one processing unit, each of the units may exist alone physically, or two or more units are integrated into one unit.

[00263] When the functions are implemented in the form of a software functional unit and sold or used as an independent product, the functions may be stored in a computer-readable storage medium. Based on such an understanding, the technical solutions of this application essentially, or the part contributing to the conventional technology, or some of the technical solutions may be

implemented in a form of a software product. The computer software product is stored in a storage medium, and includes several instructions for instructing a computer device (which may be a personal computer, a server, or a network device) to perform all or some of the steps of the methods described in embodiments of this application. The foregoing storage medium includes any medium
5 that can store program code, such as a USB flash drive, a removable hard disk, a read-only memory (read-only memory, ROM), a random access memory (random access memory, RAM), a magnetic disk, or a compact disc.

[00264] The foregoing descriptions are only specific implementations of this application, but are not intended to limit the protection scope of this application. Any variation or replacement
10 readily figured out by a person skilled in the art in the technical scope disclosed in this application shall fall in the protection scope of this application. Therefore, the protection scope of this application shall be subject to the protection scope of the claims.

CLAIMS

What is claimed is:

1. A communication method, comprising:

determining a first uplink resource, wherein the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to a semi-persistent scheduling SPS physical downlink shared channel PDSCH;

if time domain symbols occupied by the first uplink resource comprise a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determining a second time unit and a second uplink resource, wherein

the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and

sending the first feedback information on the second uplink resource.

2. The method according to claim 1, wherein the second time unit is located after the first time unit, or the second time unit and the first time unit are a same time unit.

3. The method according to claim 2, wherein a relative location of the second uplink resource in the second time unit is the same as a relative location of the first uplink resource in the first time unit.

4. The method according to any one of claims 1 to 3, wherein a time domain width of the second uplink resource is equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource is equal to a frequency domain width of the first uplink resource.

5. The method according to any one of claims 1 to 4, wherein the determining a second time unit and a second uplink resource comprises:

determining the second time unit, wherein the second time unit is a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit is not earlier than a time domain start location of the first time unit, and each candidate time unit meets a first condition and/or a second condition, wherein

the first condition is that an available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource is greater than or equal to a quantity of feedback bits, and the quantity of feedback bits is a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition is that an uplink signal exists, and the uplink signal comprises uplink data or dynamic feedback information; and

determining the second uplink resource in the second time unit.

6. The method according to claim 5, wherein the determining the second uplink resource in the second time unit comprises:

if the second time unit meets the first condition but does not meet the second condition, determining that an available SPS feedback resource in the second time unit is the second uplink resource; or

if the second time unit meets the second condition, determining that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

7. The method according to claim 5 or 6, wherein a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit comprises a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; or

a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit is greater than a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

8. The method according to any one of claims 1 to 7, wherein after the determining a second time unit and a second uplink resource, the method further comprises:

if a combination and sending condition is met, determining a third uplink resource, wherein the third uplink resource carries the first feedback information and second feedback information, wherein

the combination and sending condition is that the second time unit comprises the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and

sending the first feedback information and the second feedback information on the third uplink resource.

9. A communication method, comprising:

determining a first uplink resource, wherein the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH;

if time domain symbols occupied by the first uplink resource comprise a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determining a second time unit and a second uplink resource, wherein

the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and

receiving the first feedback information on the second uplink resource.

10. The method according to claim 9, wherein the second time unit is located after the first time unit, or the second time unit and the first time unit are a same time unit.

11. The method according to claim 10, wherein a relative location of the second uplink resource in the second time unit is the same as a relative location of the first uplink resource in the first time unit.

12. The method according to any one of claims 9 to 11, wherein a time domain width of the second uplink resource is equal to a time domain width of the first uplink resource, and/or a frequency domain width of the second uplink resource is equal to a frequency domain width of the first uplink resource.

13. The method according to any one of claims 9 to 12, wherein the determining a second time unit and a second uplink resource comprises:

determining the second time unit, wherein the second time unit is a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit is not earlier than a time domain start location of the first time unit, and each candidate time unit meets a first condition and/or a second condition, wherein

the first condition is that an available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum

value of a codebook bit interval corresponding to the available SPS feedback resource is greater than or equal to a quantity of feedback bits, and the quantity of feedback bits is a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition is that an uplink signal exists, and the uplink signal comprises uplink data or dynamic feedback information; and
5 determining the second uplink resource in the second time unit.

14. The method according to claim 13, wherein the determining the second uplink resource in the second time unit comprises:

if the second time unit meets the first condition but does not meet the second condition,
10 determining that an available SPS feedback resource in the second time unit is the second uplink resource; or

if the second time unit meets the second condition, determining that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

15. The method according to claim 13 or 14, wherein a codebook bit interval corresponding
15 to an available SPS feedback resource in the candidate time unit comprises a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; or

a minimum value of a codebook bit interval corresponding to an available SPS feedback resource in the candidate time unit is greater than a sum of a quantity of codebook bits of SPS
20 feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information.

16. The method according to any one of claims 9 to 15, wherein after the determining a second time unit and a second uplink resource, the method further comprises:

if a combination and receiving condition is met, determining a third uplink resource, wherein
25 the third uplink resource carries the first feedback information and second feedback information, wherein

the combination and receiving condition is that the second time unit comprises the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and

30 receiving the first feedback information and the second feedback information on the third uplink resource.

17. A communication apparatus, comprising a processing module and a transceiver module, wherein

the processing module is configured to determine a first uplink resource, wherein the first uplink resource is located in a first time unit and carries first feedback information, and the first
5 feedback information is feedback information corresponding to an SPS PDSCH;

the processing module is further configured to: if time domain symbols occupied by the first uplink resource comprise a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine a second time unit and a second uplink resource, wherein

the second uplink resource is located in the second time unit, all time domain symbols
10 occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and

the transceiver module is configured to send the first feedback information on the second uplink resource.

15 18. The apparatus according to claim 17, wherein the second time unit is located after the first time unit, or the second time unit and the first time unit are a same time unit.

19. The apparatus according to claim 17 or 18, wherein the processing module is further configured to determine the second time unit, wherein the second time unit is a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start
20 location of each candidate time unit is not earlier than a time domain start location of the first time unit, and each candidate time unit meets a first condition and/or a second condition, wherein

the first condition is that an available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource is greater
25 than or equal to a quantity of feedback bits, and the quantity of feedback bits is a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition is that an uplink signal exists, and the uplink signal comprises uplink data or dynamic feedback information; and

the processing module is further configured to determine the second uplink resource in the
30 second time unit.

20. The apparatus according to claim 19, wherein the processing module is further configured

to: if the second time unit meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource; or

the processing module is further configured to: if the second time unit meets the second condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

21. The apparatus according to any one of claims 17 to 20, wherein the processing module is further configured to: if a combination and sending condition is met, determine a third uplink resource, wherein the third uplink resource carries the first feedback information and second feedback information, wherein

the combination and sending condition is that the second time unit comprises the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and

the transceiver module is further configured to send the first feedback information and the second feedback information on the third uplink resource.

22. A communication apparatus, comprising a processing module and a transceiver module, wherein

the processing module is configured to determine a first uplink resource, wherein the first uplink resource is located in a first time unit and carries first feedback information, and the first feedback information is feedback information corresponding to an SPS PDSCH;

the processing module is further configured to: if time domain symbols occupied by the first uplink resource comprise a downlink symbol and/or a flexible symbol that is not indicated to be used for uplink transmission, determine a second time unit and a second uplink resource, wherein

the second uplink resource is located in the second time unit, all time domain symbols occupied by the second uplink resource are symbols used for uplink transmission, and a time domain start location of the second uplink resource is after a time domain start location of the first uplink resource; and

the transceiver module is configured to receive the first feedback information on the second uplink resource.

23. The apparatus according to claim 22, wherein the second time unit is located after the first time unit, or the second time unit and the first time unit are a same time unit.

24. The apparatus according to claim 22 or 23, wherein the processing module is further configured to determine the second time unit, wherein the second time unit is a candidate time unit with an earliest time domain location in one or more candidate time units, a time domain start location of each candidate time unit is not earlier than a time domain start location of the first time unit, and each candidate time unit meets a first condition and/or a second condition, wherein

the first condition is that an available SPS feedback resource exists, all time domain symbols of the available SPS feedback resource are symbols used for uplink transmission, a maximum value of a codebook bit interval corresponding to the available SPS feedback resource is greater than or equal to a quantity of feedback bits, and the quantity of feedback bits is a sum of a quantity of codebook bits of SPS feedback information in the candidate time unit and a quantity of codebook bits of the first feedback information; and the second condition is that an uplink signal exists, and the uplink signal comprises uplink data or dynamic feedback information; and

the processing module is further configured to determine the second uplink resource in the second time unit.

25. The apparatus according to claim 24, wherein the processing module is further configured to: if the second time unit meets the first condition but does not meet the second condition, determine that an available SPS feedback resource in the second time unit is the second uplink resource; or

the processing module is further configured to: if the second time unit meets the second condition, determine that a resource that is in the second time unit and that carries the uplink signal is the second uplink resource.

26. The apparatus according to any one of claims 22 to 25, wherein the processing module is further configured to: if a combination and receiving condition is met, determine a third uplink resource, wherein the third uplink resource carries the first feedback information and second feedback information, wherein

the combination and receiving condition is that the second time unit comprises the second feedback information, or the second uplink resource and a resource carrying the second feedback information overlap; and

the transceiver module is further configured to receive the first feedback information and the second feedback information on the third uplink resource.

27. A communication apparatus, wherein the communication apparatus comprises a processor

and a transceiver, the transceiver is configured to implement information exchange between the communication apparatus and another communication apparatus, and the processor executes program instructions to perform the communication method according to any one of claims 1 to 16.

5 28. A computer-readable storage medium, wherein the computer-readable storage medium comprises a computer program or instructions, and when the computer program or the instructions are run on a computer, the computer is enabled to perform the communication method according to any one of claims 1 to 16.

10 29. A computer program product, wherein the computer program product comprises a computer program or instructions, and when the computer program or the instructions are run on a computer, the computer is enabled to perform the communication method according to any one of claims 1 to 16.