SUMMARY

[0006] This application provides a communication method and a communication apparatus, to indicate a channel state of a channel with a larger bandwidth, so as to meet a communication requirement of a larger bandwidth.

[0007] According to a first aspect, a communication method is provided, including: a first device (which may alternatively be a module or a chip in the first device) generates first control information, where the first control information includes a first field and a second field, the first field is used to indicate a channel state of a first subchannel in a first channel segment, and the second field is used to indicate a channel state of a second subchannel in a second channel segment; and the first device sends the first control information to a second device. In an embodiment of this application, the first control information carries the two fields, and the two fields each are used to indicate a channel state of a subchannel in a channel segment, to indicate a channel state of a channel with a larger bandwidth.

[0008] Optionally, that the first field is used to indicate a channel state of a first subchannel in a first channel segment includes: A first bitmap in the first field is used to indicate a channel state of each first subchannel in the first channel segment; and that the second field is used to indicate a channel state of a second subchannel in a second channel segment includes: A second bitmap in the second field is used to indicate a channel state of each second ~~first~~ subchannel in the second channel segment.

[0009] According to a second aspect, a communication method is provided, including: A second device receives first control information from a first device, where the first control information includes a first field and a second field, the first field is used to indicate a channel state of a first subchannel in a first channel segment, and the second field is used to indicate a channel state of a second subchannel in a second channel segment; and determines channel state information of each channel based on the first control information. In an embodiment of this application, the first control information carries the two fields, and the two fields each are used to indicate a channel state of a subchannel in a channel segment, to indicate a channel state of a channel with a larger bandwidth.

[0010] Related description of the first field and the second field is the same as that in the first aspect. For details, refer to the first aspect.

device may also be referred to as a network-side device. The air interface resource may include at least one of a time domain resource, a frequency domain resource, a code resource, and a spatial resource. In the embodiments of this application, "at least one" may also be "one or more", and "a plurality of" may be two, three, four, or more. This is not limited in this application.

[0089] For example, the first device and the second device may be communication devices in Wi-Fi. For example, the first device may be an AP or a non-AP station (for example, a STA). The second ~~station~~ device may be an AP or a non-AP station. For example, the first device and the second device may be the AP and the STA in FIG. 1. That the first device is the AP or the STA and the second device is the AP or the STA is not specifically limited.

[0090] This application provides a communication method. One piece of control information carries two fields, and each field indicates a channel state of a subchannel in a channel segment, to indicate a channel state of a channel with a larger bandwidth.

[0091] The following describes the communication method according to this application with reference to FIG. 3 to FIG. 10.

[0092] FIG. 3 is a schematic diagram of a communication method 300 according to an embodiment of this application. As shown in FIG. 3, the method 300 includes the following steps.

[0093] S310: A first device generates first control information, where the first control information includes a first field and a second field, the first field is used to indicate a channel state of a first subchannel in a first channel segment, and the second field is used to indicate a channel state of a second subchannel in a second channel segment.

[0094] The first control information may include the two fields, and each field indicates a channel state of each subchannel in a channel segment. For example, the first control information may be an A-control subfield, and the first field and the second field may be BQR control subfields. In other words, the A-control subfield may include the two BQR control subfields.

[0095] It may be understood that a total bandwidth includes the first channel segment and the second channel segment. For example, two channel segments included in a 240 MHz channel may be a 160 MHz channel and an 80 MHz channel (or subchannel). For another example, two channel segments included in a 320 MHz channel may be a 160 MHz channel and a 160 MHz channel. It may be understood that the first channel segment and the second channel segment may be the same or different. This is not specifically limited.

[0096] The channel state of the first subchannel in the first channel segment may be understood

as a channel state of each of a plurality of subchannels included in the first channel segment. For example, a 160 MHz channel has eight 20 MHz subchannels, which may also be understood as that a granularity is 20 MHz. To be specific, the first subchannel is a 20 MHz subchannel. For another example, an 80 MHz channel has four 20 MHz subchannels, which may also be understood as that a granularity is 20 MHz. To be specific, the first subchannel is a 20 MHz subchannel.

[0097] The first subchannel may alternatively be of another value, for example, a subchannel granularity or a subchannel bandwidth in the S1G standard. In the S1G standard (IEEE 802.11ah), the subchannel granularity is 2 MHz, 4 MHz, 8 MHz, or 16 MHz, and the subchannel bandwidth is 2 MHz. When the subchannel granularity or the subchannel bandwidth in the S1G standard is extended to 32 MHz or 24 MHz, a channel segment of the S1G standard may be 16 MHz or 8 MHz, and the subchannel bandwidth or the granularity is 2 MHz.

[0098] It may be understood that the foregoing description about "the channel state of the first subchannel in the first channel segment" is also applicable to "the channel state of the second subchannel in the second channel segment". The description about the first subchannel is also applicable to the second subchannel.

[0099] It may further be understood that the first subchannel and the second subchannel may be the same or different. This is not specifically limited.

[00100] Optionally, that the first field is used to indicate a channel state of a first subchannel in a first channel segment includes: A first bitmap in the first field is used to indicate a channel state of each first subchannel in the first channel segment; and that the second field is used to indicate a channel state of a second subchannel in a second channel segment includes: A second bitmap in the second field is used to indicate a channel state of each second ~~first~~ subchannel in the second channel segment.

[00101] The first bitmap includes a plurality of bits, and each bit may indicate a channel state of one subchannel. The channel state may include an available state or a busy state (or an unavailable state).

[00102] It may be understood that a quantity of bits included in the first bitmap may be the same as or different from a quantity of bits included in the second bitmap. This is not specifically limited.

[00103] For example, the first control information may be an A-control subfield in an HT control field of an HE type. The first field and the second field may be BQR control subfields, and each BQR control subfield indicates a channel state of a subchannel in a channel segment.

state of the first subchannel in the first channel segment and the channel state of the second subchannel in the second channel segment that are reported by the first device.

[00127] In this embodiment of this application, the first control information includes the first bitmap and the first bit, to indicate a channel state of a channel with a total bandwidth greater than 160 MHz (for example, 240 MHz or 320 MHz), so as to meet a communication requirement of a larger bandwidth. The first control information includes one BQR control subfield. The BQR control subfield may be of a type of BQR control in a current standard. The first bitmap is the first 8 bits in the BQR control subfield, and reserved bits in the BQR control subfield may be used to indicate the channel state of the second channel segment. No extra overhead is required.

[00128] Optionally, that a first bit is used to indicate a channel state of a second channel segment includes: A value of the first bit is a first value, and the first value indicates that a channel state of a subchannel in the second channel segment is available; or a value of the first bit is a second value, and the second value indicates that a channel state of a subchannel in the second channel segment is busy or unavailable. Herein, the first value or the second value indicates a channel state of each subchannel in the second channel segment. For example, when the first value is 1, it indicates that a channel state of each subchannel in a plurality of subchannels (or all subchannels) in the second channel segment is available. For another example, when the second value is 0, it indicates that a channel state of each subchannel in a plurality of subchannels (or all subchannels) in the second channel segment is busy or unavailable.

[00129] In this embodiment of this application, the first bit may be one reserved bit, or may be 2 reserved bits. This is not limited.

[00130] A case in which the first bit is one reserved bit is described with reference to the schematic diagram in FIG. 6. It is assumed that an A-control subfield includes only one BQR control subfield. As shown in FIG. 6, in 10 bits included in the BQR control subfield, the first 8 bits are an available channel bitmap (available channel bitmap), and are used to indicate busy/available state information of the first channel segment. In addition, the last 2 bits in the 10 bits are originally reserved bits, where one reserved bit (the first bit) is used to indicate busy/available state information of the second channel segment, and the another reserved bit may be used as a reserved bit or another user. For example, the reserved bit used to indicate the busy/available state information of the second channel segment may be referred to as an information about the other channel segment (information for the other channel segment) subfield.

field is used to indicate a channel state of a first subchannel in a first channel segment; and the second field is used to indicate a channel state of a second subchannel in a second channel segment. The transceiver unit 1020 is configured to send the first control information to a second device.

[00197] Optionally, that the first field is used to indicate a channel state of a first subchannel in a first channel segment includes: A first bitmap in the first field is used to indicate a channel state of each first subchannel in the first channel segment; and that the second field is used to indicate a channel state of a second subchannel in a second channel segment includes: A second bitmap in the second field is used to indicate a channel state of each second ~~first~~ subchannel in the second channel segment.

[00198] Alternatively, in an embodiment, the processing unit 1010 is configured to generate first control information, where a first bitmap in the first control information is used to indicate a channel state of a first subchannel in a first channel segment; and a first bit in the first control information is used to indicate a channel state of a second channel segment. The transceiver unit 1020 is configured to send the first control information to a second device.

[00199] Optionally, a second bit in the first control information is used to indicate the first channel segment.

[00200] Optionally, that a first bit is used to indicate a channel state of a second channel segment includes: A value of the first bit is a first value, and the first value indicates that a channel state of a subchannel in the second channel segment is available; or a value of the first bit is a second value, and the second value indicates that a channel state of a subchannel in the second channel segment is busy or unavailable.

[00201] Optionally, the first bitmap is used to indicate that the first channel segment is predefined by a protocol.

[00202] Alternatively, in an embodiment, the processing unit 1010 is configured to: after receiving a bandwidth query report poll BQRP message, invoke the transceiver unit 1020 to send a bandwidth query report BQR to a second device, where the BQR includes channel state information of a basic service set BSS operating channel bandwidth; and after receiving a first request to send frame, invoke the transceiver unit 1020 to send the BQR to the second device.

[00203] Optionally, that the transceiver unit 1020 is configured to send the BQR to the second device includes: sending the BQR to the second device after a short interframe space SIFS time.

[00204] Optionally, after receiving the bandwidth query report poll BQRP message, the

CLAIMS

What is claimed is:

1. A communication method, comprising:

generating, by a first device, first control information, wherein the first control information comprises a first field and a second field, the first field is used to indicate a channel state of a first subchannel in a first channel segment, and the second field is used to indicate a channel state of a second subchannel in a second channel segment; and

sending, by the first device, the first control information to a second device.

2. The method according to claim 1, wherein that the first field is used to indicate a channel state of a first subchannel in a first channel segment comprises: a first bitmap in the first field is used to indicate a channel state of each first subchannel in the first channel segment; and

that the second field is used to indicate a channel state of a second subchannel in a second channel segment comprises: a second bitmap in the second field is used to indicate a channel state of each ~~first~~ second subchannel in the second channel segment.

3. The method according to claim 1 or 2, wherein

the first control information is an A-control subfield;

the first field and the second field are bandwidth query report (BQR) control subfields.

4. The method according to any one of claims 1 to 3, wherein the bandwidth of the first channel segment is 160 MHZ, and the bandwidth of the second channel segment is 160 MHZ.

5. A communication method, comprising:

receiving, by a second device, first control information from a first device, wherein the first control information comprises a first field and a second field, the first field is used to indicate a channel state of a first subchannel in a first channel segment, and the second field is used to indicate a channel state of a second subchannel in a second channel segment; and

determining, by the second device, the channel state of the first subchannel and the channel state of the second subchannel.

6. The method according to claim 5, wherein that the first field is used to indicate a channel state of a first subchannel in a first channel segment comprises: a first bitmap in the first field is used to indicate a channel state of each first subchannel in the first channel segment; and

that the second field is used to indicate a channel state of a second subchannel in a second

channel segment comprises: a second bitmap in the second field is used to indicate a channel state of each second subchannel in the second channel segment.

7. The method according to claim 5 or 6, wherein

the first control information is an A-control subfield;

the first field and the second field are bandwidth query report (BQR) control subfields.

8. The method according to any one of claims 5 to 7, wherein the bandwidth of the first channel segment is 160 MHZ, and the bandwidth of the second channel segment is 160 MHZ.

~~3~~9. A communication method, comprising:

generating, by a first device, first control information, wherein a first bitmap in the first control information is used to indicate a channel state of a first subchannel in a first channel segment, and a first bit in the first control information is used to indicate a channel state of a second channel segment; and

sending, by the first device, the first control information to a second device.

~~4~~10. The method according to claim ~~3~~9, wherein a second bit in the first control information is used to indicate the first channel segment.

~~5~~11. The method according to claim ~~3~~ 9 or ~~4~~10, wherein that a first bit is used to indicate a channel state of a second channel segment comprises:

a value of the first bit is a first value, and the first value indicates that a channel state of a subchannel in the second channel segment is available; or

a value of the first bit is a second value, and the second value indicates that a channel state of a subchannel in the second channel segment is busy or unavailable.

12. A communication method, comprising:

receiving, by a second device, first control information from a first device, wherein a first bitmap in the first control information is used to indicate a channel state of a first subchannel in a first channel segment, and a first bit in the first control information is used to indicate a channel state of a second channel segment; and

determining, by the second device, the channel state of the first subchannel and the channel state of the second subchannel.

13. The method according to claim 12, wherein a second bit in the first control information is used to indicate the first channel segment.

14. The method according to claim 12 or 13, wherein that a first bit is used to indicate a

channel state of a second channel segment comprises:

a value of the first bit is a first value, and the first value indicates that a channel state of a subchannel in the second channel segment is available; or

a value of the first bit is a second value, and the second value indicates that a channel state of a subchannel in the second channel segment is busy or unavailable.

~~6. The method according to claim 3, wherein the first bitmap is used to indicate that the first channel segment is predefined by a protocol.~~

~~7. A communication method, comprising:~~

~~after receiving a bandwidth query report poll (bandwidth query report poll, BQRP) message, sending, by a first device, a bandwidth query report (bandwidth query report, BQR) to a second device, wherein the BQR comprises channel state information of a basic service set (basic service set, BSS) operating channel bandwidth; and~~

~~after receiving a first request to send frame, sending, by the first device, the BQR to the second device.~~

~~8. The method according to claim 7, wherein the sending, by the first device, the BQR to the second device comprises:~~

~~sending, by the first device, the BQR to the second device after a short interframe space (short interframe space, SIFS) time.~~

~~9. The method according to claim 7 or 8, wherein after the first device receives the bandwidth query report poll BQRP message, the first device sends the bandwidth query report BQR to the second device, wherein~~

~~the BQR is carried in a trigger-based physical layer protocol data unit (trigger-based PHY protocol data unit, TB PPDU); and~~

~~after the first device receives the first request to send frame, the first device sends the BQR to the second device, wherein the BQR is carried in a non-high throughput physical layer protocol data unit PPDU or a non-high throughput duplicate physical layer protocol data unit PPDU.~~

~~10. The method according to any one of claims 7 to 9, wherein after the first device receives the bandwidth query report poll BQRP message, the first device sends the bandwidth query report BQR to the second device, and before the first device sends the BQR to the second device, the method further comprises:~~

~~determining, by the first device, that a subchannel on which a resource unit (resource unit, RU) is located is in an available state; and~~

~~after the first device receives the first request to send frame, the first device sends the BQR to the second device, and before the first device sends the BQR to the second device, the method further comprises:~~

~~determining, by the first device, that a primary subchannel in the BSS operating channel bandwidth is in an available state.~~

~~11. The method according to any one of claims 7 to 10, wherein after receiving the bandwidth query report poll BQRP message, the first device sends the bandwidth query report BQR to the second device, and the method further comprises:~~

~~sensing, by the first device, each channel in the BSS operation channel bandwidth in the short interframe space SIFS time after the first device receives a PPDU carrying the BQRP message; and~~

~~after receiving the first request to send frame, the first device sends the BQR to the second device, and the method further comprises:~~

~~sensing, by the first device, each channel in the BSS operation channel bandwidth in a point coordination function interframe space (point coordination function interframe space, PIFS) time before the first device receives a PPDU carrying the first request to send frame.~~

~~12. A communication apparatus, comprising a module configured to perform the method according to any one of claims 1 or 2, a unit configured to perform the method according to any one of claims 3 to 6, or a unit configured to perform the method according to any one of claims 7 to 11.~~

~~13~~15. A communication apparatus, comprising a processor and a transceiver, wherein the transceiver is configured to: receive a signal from another communication apparatus other than the communication apparatus and transmit the signal to the processor, or send a signal from the processor to another communication apparatus other than the communication apparatus; and the processor is configured to implement the method according to any one of claims 1 ~~or~~ to ~~2, the method according to any one of claims 3 to 6, or the method according to any one of claims 7 to 11~~14 by using a logic circuit or executing code instructions.

~~14~~16. A computer-readable storage medium, wherein the storage medium stores a program or instructions, and when the program or the instructions is/are run, the method according to any one

of claims 1 to 14~~or 2, the method according to any one of claims 3 to 6, or the method according to any one of claims 7 to 11~~ is implemented.

~~15~~17. A ~~computer~~ program product, comprising a computer program, wherein when the computer program is run on a computer, the computer is enabled to perform the communication method according to any one of claims 1 to 14~~or 2, the communication method according to any one of claims 3 to 6, or the communication method according to any one of claims 7 to 11~~.