NDPA frame. The HE NDPA frame includes a station information field. The station information field includes a station association identifier (Association Identifier, AID) subfield, a partial bandwidth information (partial bandwidth information, Partial BW Info) subfield, a feedback type (feedback type) and number of grouping (Number of grouping) subfield, and a number of columns (Number of columns, Nc) subfield. The partial bandwidth information subfield is used to indicate a frequency domain range for which the STA needs to feed back channel state information. The partial bandwidth information subfield includes a resource unit (resource unit, RU) start index (start index) and a resource unit end index (end index) to indicate a segment of contiguous RUs, thereby indicating a frequency domain range corresponding to the segment of contiguous RUs. However, a maximum bandwidth allowed for transmission is 160 MHz. The bandwidth of 160 MHz corresponds to a maximum of seventy-four 26-tone resource units (26-tone RU). The RU start index and the RU end index separately indicate one of the seventy-four 26-tone RUs.

[0005] However, as WLAN technologies develop, transmission in a larger bandwidth needs to be supported in a next-generation Wi-Fi standard (for example, 802.11be or Wi-Fi 7), for example, transmission in a bandwidth greater than 160 MHz. Before data transmission is performed, channel sounding needs to be performed. Therefore, the following is crucial: how to perform channel sounding on a channel with a larger bandwidth (for example, a bandwidth greater than 160 MHz) to obtain channel state information, so as to support data transmission in a larger bandwidth and improve a transmission rate in the next-generation Wi-Fi standard.

SUMMARY

[0005a] In a first aspect, the present disclosure refers to a null data packet announcement (NDPA) frame transmission method, comprising: generating an NDPA frame, wherein the NDPA frame comprises a station information field, and the station information field comprises an association identifier (AID) subfield indicating an AID of a station; the station information field further comprises a partial bandwidth information subfield; the partial bandwidth information subfield comprises a resource unit (RU) indication index, wherein the RU indication index indicates an RU in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information; and a granularity of the RU indicated by the RU indication index comprises at least one of a 242-tone RU, a 484-tone RU, a 996-tone RU, a 484+996-tone

RU, a 242+484-tone RU, a 2*996-tone RU, a 2*996+484-tone RU, a 3*996-tone RU, a 3*996+484-tone RU, or a 4*996-tone RU; and transmitting the NDPA frame.

[0005b] In a second aspect, the present disclosure refers to an NDPA frame transmission method, comprising: receiving an NDPA frame, wherein the NDPA frame comprises a station information field, and the station information field comprises an AID subfield indicating an association identifier AID of a station; the station information field further comprises a partial bandwidth information subfield; the partial bandwidth information subfield comprises an RU indication index, wherein the RU indication index indicates an RU in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information; and a granularity of the RU indicated by the RU indication index comprises at least one of a 242-tone RU, a 484-tone RU, a 996-tone RU, a 484+996-tone RU, a 242+484-tone RU, a 2*996-tone RU, a 2*996+484-tone RU, a 3*996-tone RU, a 3*996+484-tone RU, or a 4*996-tone RU; and obtaining from the NDPA frame, the RU for which channel state information needs to be fed back.

[0006] Examples of this application provide an NDPA frame transmission method and a related apparatus, to meet a requirement for indicating an RU that is in a bandwidth greater than 160 MHz and for which channel state information needs to be fed back.

[0007] According to a first example, an implementation of this application provides an NDPA frame transmission method, including the following steps.

[0008] An access point generates an NDPA frame. The NDPA frame includes a station information field. The station information field includes an AID subfield indicating an association identifier AID of a station. The station information field further includes a partial bandwidth information subfield and/or a number of columns subfield. The partial bandwidth information

subfield indicates a resource unit (resource unit, RU) that is in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information. The number of columns subfield indicates a quantity of columns in a compressed beamforming feedback matrix. The bandwidth corresponding to the NDPA frame is greater than 160 MHz. A column quantity indicated by the number of columns subfield is greater than 8.

[0009] The access point transmits the NDPA frame.

[0010] According to a second example, an implementation of this application provides an NDPA frame transmission method, including the following steps.

[0011] A station receives an NDPA frame. The NDPA frame includes a station information field. The station information field includes an AID subfield indicating an association identifier AID of a station. The station information field further includes a partial bandwidth information subfield and/or a number of columns subfield. The partial bandwidth information subfield indicates an RU that is in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information. The bandwidth corresponding to the NDPA frame is greater than 160 MHz. A column quantity indicated by the number of columns subfield is greater than 8.

[0012] The station obtains, from the NDPA frame, the RU for which channel state information needs to be fed back.

[0013] According to a third example, an implementation of this application further provides a transmission apparatus, including a processing unit and a transmitting unit.

[0014] The processing unit is configured to generate an NDPA frame. The NDPA frame includes a station information field. The station information field includes an AID subfield indicating an association identifier AID of a station. The station information field further includes a partial bandwidth information subfield and/or a number of columns subfield. The partial bandwidth information subfield indicates a resource unit (resource unit, RU) that is in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information. The number of columns subfield indicates a quantity of columns in a compressed beamforming feedback matrix. The bandwidth corresponding to the NDPA frame is greater than 160 MHz. A column quantity indicated by the number of columns subfield is greater than 8.

[0015] The transmitting unit is configured to transmit the NDPA frame.

[0016] According to a fourth example, an implementation of this application further provides a

transmission apparatus, including a processing unit and a receiving unit.

[0017] The receiving unit is configured to receive an NDPA frame. The NDPA frame includes a station information field. The station information field includes an AID subfield indicating an association identifier AID of a station. The station information field further includes a partial bandwidth information subfield and/or a number of columns subfield. The partial bandwidth information subfield indicates an RU that is in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information. The bandwidth corresponding to the NDPA frame is greater than 160 MHz. A column quantity indicated by the number of columns subfield is greater than 8.

[0018] The processing unit is configured to obtain, from the NDPA frame, the RU for which channel state information needs to be fed back.

[0019] In technical solutions in this application, the partial bandwidth information subfield in the NDPA frame indicates an RU that is in a bandwidth greater than 160 MHz and for which channel state information needs to be fed back. The station information field can indicate the station to sound a channel with a bandwidth greater than 160 MHz, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and improving transmission efficiency. The column quantity indicated by the number of columns subfield is greater than 8. The station information field can indicate the station to sound a channel with a bandwidth whose column quantity is greater than 8, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in more streams and improving transmission efficiency.

[0020] In addition or alternatively, a channel with a stream quantity greater than 8 is sounded, and a beamforming report is fed back based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and/or in more streams and improving transmission efficiency.

[0021] In some implementations, the NDPA frame includes type information, and the type information indicates that the NDPA frame is an extremely high throughput EHT NDPA frame.

[0022] In this way, the type information can indicate an NDPA frame variant corresponding to 802.11be or another standard that occurs after 802.11be. For example, the NDPA frame variant may be an extremely high throughput (extremely high throughput, EHT) NDPA frame corresponding to the 802.11be standard. The EHT NDPA frame can indicate an RU that is in a

bandwidth greater than 160 MHz and for which channel state information needs to be fed back, to indicate a station to sound a channel with a bandwidth greater than 160 MHz, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and improving transmission efficiency. The EHT NDPA frame can further indicate a column quantity greater than 8, to indicate a station to sound a channel with a bandwidth whose column quantity is greater than 8, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in more streams and improving transmission efficiency.

[0023] It should be understood that the NDPA frame provided in this implementation of this application is also applicable to a case in which a bandwidth is less than or equal to 160 MHz or a case in which an indicated column quantity is less than or equal to 8.

[0024] In some implementations, the NDPA frame further includes a sounding dialog token field and a special station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The type information is carried in the frame type subfield and the frame subtype subfield. The frame type subfield indicates that the NDPA frame is not a high throughput (high throughput, HE) NDPA frame or a ranging (Ranging) NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0025] In this way, an HE STA or a ranging STA that does not support the EHT NDPA frame identifies the EHT NDPA frame as a VHT NDPA frame based on the frame type subfield in the sounding dialog token field, and reads the NDPA frame according to a format of a VHT NDPA frame. The station information field in the EHT NDPA frame does not include an AID of the HE STA or the ranging STA. The HE STA or the ranging STA receiving the EHT NDPA frame identifies a mismatch between the AID in the station information field and the AID of the HE STA or the ranging STA, and does not provide feedback based on the NDPA frame. In this way, the HE STA or the ranging STA can be prevented from misreading the EHT NDPA frame. An EHT STA supporting the EHT NDPA frame can determine, based on the frame subtype subfield, whether the NDPA frame is an EHT NDPA frame. When the frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame, the EHT STA reads the partial bandwidth information subfield and/or the number of columns subfield in the NDPA frame according to a structure of an EHT NDPA frame, thereby accurately obtaining information about a partial bandwidth for which

channel state information needs to be fed back and/or a quantity of columns for which feedback needs to be provided.

[0026] It should be understood that the HE STA in this application is an HE STA that does not support an NDPA frame variant occurring after an HE NDPA frame, and the ranging STA in this example of this application is an earlier-version ranging STA that does not support an NDPA frame variant occurring after a ranging NDPA frame.

[0027] The following provides some implementations of the partial bandwidth information subfield.

[0028] In some implementations, the partial bandwidth information subfield includes a resource unit start index and a resource unit offset index. The resource unit start index is used to indicate a first RU for which the station needs to feed back channel state information. The resource unit offset index indicates an offset, relative to the first RU, of a last RU for which the station needs to feed back channel state information. In this way, the station can determine, based on the offset and the first RU indicated by the partial bandwidth information subfield, the last RU for which channel state information needs to be fed back. As such, a bit quantity of the resource unit offset index can be compressed, and a quantity of bits required by the partial bandwidth information subfield can be further compressed when same partial bandwidth information is indicated, thereby supporting indication of an RU that is in a larger bandwidth and for which channel state information needs to be fed back without increasing a bit quantity of the partial bandwidth information subfield.

[0029] In this application, the resource unit start index uses eight bits, and the resource unit offset index uses five or less bits. In this way, when a solution in this application is compared with a solution in which the HE NDPA frame uses a 14-bit partial bandwidth information subfield, a bit quantity of the partial bandwidth information subfield can be reduced, and a saved bit can be added to the number of columns subfield. In this case, bits of the number of columns subfield are increased, so that the number of columns subfield indicates a column quantity greater than 8.

[0030] In a specific implementation, the resource unit offset index indicates the offset of the last RU relative to the first RU by indicating a multiple that the offset is of a basic granularity. In other words, the resource unit offset index indicates the offset by indicating a value obtained by dividing the offset by the basic granularity. When being expressed by a mathematical expression, the resource unit offset index may be expressed as N=offset/basic granularity. The resource unit

offset index may indicate the offset by indicating N, where N is a positive integer. In this way, the resource unit offset index can be more effectively compressed, thereby helping support indication of an RU that is in a larger bandwidth and for which channel state information needs to be fed back, and also helping the number of columns subfield indicate a larger column quantity.

[0031] A degree of compression of the resource unit offset index may be adjusted by adjusting the basic granularity. A larger basic granularity indicates a greater degree of compression. A greater degree of compression indicates a smaller quantity of bits required to indicate a same offset, and indicates less signaling overheads. In this way, the partial bandwidth information subfield can support indication of an RU that is in a larger bandwidth and for which channel state information needs to be fed back. Optionally, the basic granularity is eight 26-tone RUs.

[0032] In some other implementations, the partial bandwidth information subfield includes an RU indication index. The RU indication index includes a frequency domain indication part and an RU indication part. The frequency domain indication part is used to indicate a frequency domain range in which the RU for which the station needs to feed back channel state information is located. The RU indication part is used to indicate the RU for which channel state information needs to be fed back. The RU for which channel state information needs to be fed back may be one RU or a combination of a plurality of RUs. In this way, the partial bandwidth information subfield requires a smaller bit quantity when indicating information about a partial bandwidth that is in a same bandwidth, and signaling overheads are less, thereby supporting indication of an RU that is in a larger bandwidth and for which channel state information needs to be fed back, and also helping the number of columns subfield indicate a larger column quantity.

[0033] In a specific implementation, the RU indication index is nine bits, where the frequency domain indication part is two bits, and the RU indication part is seven bits. In this way, by appropriately allocating the bits to the frequency domain indication part and the RU indication part, an RU that is in a larger bandwidth and for which channel state information needs to be fed back can be indicated by using a smaller quantity of bits.

[0034] In some other implementations, the partial bandwidth information subfield includes an RU indication index. The RU indication index indicates an RU corresponding to a partial or full bandwidth for which the station needs to feed back channel state information, and indicates a frequency position of the RU in a complete bandwidth.

[0035] Specifically, a minimum RU granularity indicated by the RU indication index is one

242-tone RU. In this way, it is unnecessary to indicate a small RU, thereby helping reduce a quantity of bits of the RU indication index and reducing indication overheads.

[0036] In an example, a partial bandwidth for which channel state information needs to be fed back is N*80 MHz, and an RU corresponding to the partial bandwidth for which channel state information needs to be fed back is an N*996-tone RU, where N=1, 2, 3, or 4. The RU indication index includes a 4-bit bitmap. Each bit in the bitmap corresponds to one 80 MHz. Each bit in the bitmap is used to indicate whether 80 MHz corresponding to the bit is the partial bandwidth for which channel state information needs to be fed back.

[0037] In another example, a bandwidth for which channel state information needs to be fed back is a complete bandwidth. The RU indication index is a first index used to indicate the complete bandwidth. Optionally, the complete bandwidth is one of 20 MHz, 40 MHz, 80 MHz, 160 MHz, or 320 MHz.

[0038] Optionally, the RU indication index is five bits, six bits, or seven bits.

[0039] Specifically, when the RU indication index is five bits, the RU indication index indicates only a single RU.

[0040] When the RU indication index is six bits, an RU indicated by the RU indication index may be one of a 242-tone RU, a 484-tone RU, a 484+996-tone RU, a 242+484-tone RU, a 996-tone RU, a 2*996-tone RU, a 3*996-tone RU, or a 4*996-tone RU.

[0041] When the RU indication index is seven bits, an RU indicated by the RU indication index may be one of a 242-tone RU, a 484-tone RU, a 484+996-tone RU, a 242+484-tone RU, a 996-tone RU, a 2*996-tone RU, a 2*996+484-tone RU, a 3*996-tone RU, a 3*996+484-tone RU, or a 4*996-tone RU.

[0042] In still some other implementations, the partial bandwidth information subfield includes a resource unit start index and a resource unit end index. The resource unit start index is used to indicate a first RU for which the station needs to feed back channel state information. The resource unit end index is used to indicate a last RU for which the station needs to feed back channel state information. The first RU is a $(k_1*n+c_1)^{th}$ 26-tone RU, where c_1 and k_1 are positive integers, and n is a natural number. The last RU is a $(k_2*m+c_2)^{th}$ 26-tone RU, where c_2 and k_2 are positive integers, and m is a natural number. The resource unit start index indicates the first RU by indicating n. The resource unit end index indicates the last RU by indicating m. $k_1 \geq 2$ and/or $k_2 \geq 2$. In this way, a degree of compression of the partial bandwidth information subfield can be adjusted

by adjusting a value of k_1 or k_2 or adjusting values of both k_1 and k_2. A larger k_1 indicates a greater degree of compression of the partial bandwidth information subfield, and a larger k_2 also indicates a greater degree of compression of the partial bandwidth information subfield. A greater degree of compression indicates a smaller quantity of bits required to indicate same partial bandwidth information. In this way, the partial bandwidth information subfield can support indication of an RU that is in a larger bandwidth and for which channel state information needs to be fed back.

[0043] In any one of the foregoing implementations, the station information field may use four octets. In this way, an RU that is in a bandwidth greater than 160 MHz and for which channel state information needs to be fed back, and/or a stream quantity greater than 8 can be indicated without increasing overheads of the station information field. In this case, the station information field can indicate the station to sound a channel with a bandwidth greater than 160 MHz and/or a channel with a stream quantity greater than 8, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and/or in more streams and improving transmission efficiency.

[0044] In addition, an octet quantity of the station information field in the EHT NDPA frame is consistent with an octet quantity of a station information field in the HE NDPA frame. Compared with a solution in which the octet quantity of the station information field in the EHT NDPA frame is set to 6, this solution using the 4-octet station information field can prevent an HE STA from misreading. This is because the HE STA may not be able to accurately identify a type of the EHT NDPA frame, and may consider the EHT NDPA frame as an HE NDPA frame and read the EHT NDPA frame according to a structure of an HE NDPA frame. If the station information field in the EHT NDPA frame is six octets, the HE STA reads first 11 bits of third two octets of the station information field as an AID. If the first 11 bits of the third two octets of the station information field happen to match an AID of the HE STA, the HE STA mistakes the third two octets and two octets following the third two octets for a station information field of the HE STA. In this way, incorrect bit reading causes the HE STA to misread.

[0045] The octet quantity of the 4-octet station information field provided in this application is consistent with the octet quantity of the station information field in the HE NDPA frame, and first 11 bits of each two octets of the station information field in the EHT NDPA frame indicate an AID of an EHT STA. Even if the HE STA considers the EHT NDPA frame as an HE NDPA frame and reads the EHT NDPA frame according to the structure of the HE NDPA frame, the HE STA

recognizes that first 11 bits of each two octets do not match the AID of the HE STA, thereby effectively preventing the HE STA from misreading.

[0046] According to a fifth example, an implementation of this application further provides an NDPA frame transmission method, including the following steps.

[0047] An access point generates an NDPA frame. The NDPA frame includes at least two station information fields. Two of the at least two station information fields include an AID subfield indicating an association identifier AID of a same station. The access point transmits the NDPA frame.

[0048] The two station information fields meet at least one of the following:

partial bandwidth information subfields in the two station information fields jointly indicate an RU for which the station needs to feed back channel state information, and a bandwidth corresponding to the NDPA frame is greater than 160 MHz; or

a number of columns subfield in one of the two station information fields and a number of columns subfield in the other station information field indicate a quantity of columns in a compressed beamforming feedback matrix, and a column quantity indicated by the number of columns subfields is greater than 8.

[0049] The access point transmits the NDPA frame.

[0050] According to a sixth example, an implementation of this application further provides an NDPA frame transmission method, including the following steps.

[0051] A station receives an NDPA frame. The NDPA frame includes at least two station information fields. Two of the at least two station information fields include an AID subfield indicating an association identifier AID of a same station. The access point transmits the NDPA frame.

[0052] The two station information fields meet at least one of the following:

partial bandwidth information subfields in the two station information fields jointly indicate an RU for which the station needs to feed back channel state information, and a bandwidth corresponding to the NDPA frame is greater than 160 MHz; or

a number of columns subfield in one of the two station information fields and a number of columns subfield in the other station information field indicate a quantity of columns in a compressed beamforming feedback matrix, and a column quantity indicated by the number of columns subfields is greater than 8.

[0053] The station obtains, from the NDPA frame, the RU for which channel state information needs to be fed back.

[0054] According to a seventh example, an implementation of this application further provides a transmission apparatus, including a processing unit and a transmitting unit.

[0055] The processing unit is configured to generate an NDPA frame. The NDPA frame includes at least two station information fields. Two of the at least two station information fields include an AID subfield indicating an association identifier AID of a same station. The access point transmits the NDPA frame.

[0056] The two station information fields meet at least one of the following:

partial bandwidth information subfields in the two station information fields jointly indicate an RU for which the station needs to feed back channel state information, and a bandwidth corresponding to the NDPA frame is greater than 160 MHz; or

a number of columns subfield in one of the two station information fields and a number of columns subfield in the other station information field indicate a quantity of columns in a compressed beamforming feedback matrix, and a column quantity indicated by the number of columns subfields is greater than 8.

[0057] The transmitting unit is configured to transmit the NDPA frame.

[0058] According to an eighth example, an implementation of this application further provides a transmission apparatus, including a processing unit and a receiving unit.

[0059] The receiving unit is configured to receive an NDPA frame. The NDPA frame includes at least two station information fields. Two of the at least two station information fields include an AID subfield indicating an association identifier AID of a same station. The access point transmits the NDPA frame.

[0060] The two station information fields meet at least one of the following:

partial bandwidth information subfields in the two station information fields jointly indicate an RU for which the station needs to feed back channel state information, and a bandwidth corresponding to the NDPA frame is greater than 160 MHz; or

a number of columns subfield in one of the two station information fields and a number of columns subfield in the other station information field indicate a quantity of columns in a compressed beamforming feedback matrix, and a column quantity indicated by the number of columns subfields is greater than 8.

[0061] The processing unit is configured to obtain, from the NDPA frame, the RU for which channel state information needs to be fed back.

[0062] In this way, a station information field corresponding to a station can be newly added without changing a station information field that is originally included in an NDPA frame and that corresponds to the station. Partial bandwidth information subfields in the two station information fields cooperate to indicate an RU that is in a bandwidth greater than 160 MHz and for which channel state information needs to be fed back. The station can be indicated to sound a channel with a bandwidth greater than 160 MHz, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and improving transmission efficiency. Number of columns subfields in the two station information fields cooperate to indicate a column quantity greater than 8. The station can be indicated to sound a channel with a bandwidth whose column quantity is greater than 8, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in more streams and improving transmission efficiency.

[0063] The two station information fields indicate, in two manners, an RU for which the station needs to feed back channel state information. In a specific implementation, a resource unit start index in one of the two station information fields and a resource unit start index in the other station information field indicate a first RU that is in the bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information, and a resource unit end index in the one station information field and a resource unit end index in the other station information field indicate a last RU for which the station needs to feed back channel state information. For example, the resource unit start index in the one station information field is seven bits, the resource unit start index in the other station information field is one bit, the resource unit end index in the one station information field is one bit, and the resource unit end index in the other station information field is one bit.

[0064] In another specific implementation, one of the two station information fields includes a resource unit start index, used to indicate a first RU for which the station needs to feed back channel state information, and the other station information field includes a resource unit end index, used to indicate a last RU for which the station needs to feed back channel state information.

[0065] Optionally, of the two station information fields, a number of columns subfield in one station information field is three bits, and a number of columns subfield in the other station

information field is one bit.

[0066] In some implementations, the NDPA frame includes type information, and the type information indicates that the NDPA frame is an extremely high throughput EHT NDPA frame.

[0067] In some implementations, the NDPA frame further includes a sounding dialog token field and a special station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The type information is carried in the frame type subfield and the frame subtype subfield. The frame type subfield indicates that the NDPA frame is not an HE NDPA frame or a ranging NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0068] The special station information field further includes a special AID. The special AID indicates that the station information field is a special station information field. The special AID may be, for example, but is not limited to, 2047.

[0069] According to a ninth example, an implementation of this application further provides an NDPA frame transmission method, including the following steps.

[0070] An access point generates an NDPA frame. The NDPA frame includes a sounding dialog token field, a special station information field, and a station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The frame type subfield indicates that the NDPA frame is not an HE NDPA frame or a ranging NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0071] The access point transmits the NDPA frame.

[0072] According to a tenth example, an implementation of this application further provides an NDPA frame transmission method, including the following steps.

[0073] A station receives an NDPA frame. The NDPA frame includes a sounding dialog token field, a special station information field, and a station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The frame type subfield indicates that the NDPA frame is not an HE NDPA frame or a ranging NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0074] The station obtains the frame type subfield and the frame subtype subfield from the NDPA frame, to determine that the NDPA frame is an EHT NDPA frame.

[0075] According to an eleventh example, an implementation of this application further provides a transmission apparatus, including a processing unit and a transmitting unit.

[0076] The processing unit is configured to generate an NDPA frame. The NDPA frame includes a sounding dialog token field, a special station information field, and a station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The frame type subfield indicates that the NDPA frame is not an HE NDPA frame or a ranging NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0077] The transmitting unit is configured to transmit the NDPA frame.

[0078] According to a twelfth example, an implementation of this application further provides a transmission apparatus, including a processing unit and a receiving unit.

[0079] The receiving unit is configured to receive an NDPA frame. The NDPA frame includes a sounding dialog token field, a special station information field, and a station information field. The sounding dialog token field includes a frame type subfield. The special station information field includes a frame subtype subfield. The frame type subfield indicates that the NDPA frame is not an HE NDPA frame or a ranging NDPA frame. The frame subtype subfield indicates that the NDPA frame is an EHT NDPA frame.

[0080] The processing unit is configured to obtain the frame type subfield and the frame subtype subfield from the NDPA frame, to determine that the NDPA frame is an EHT NDPA frame.

[0081] In this way, the frame type subfield and the frame subtype subfield jointly indicate that the NDPA frame is an EHT NDPA frame. The EHT NDPA frame can indicate an RU that is in a bandwidth greater than 160 MHz and for which channel state information needs to be fed back, to indicate a station to sound a channel with a bandwidth greater than 160 MHz, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in a larger bandwidth and improving transmission efficiency. The EHT NDPA frame can further indicate a column quantity greater than 8, to indicate a station to sound a channel with a bandwidth whose column quantity is greater than 8, and feed back a beamforming report based on a channel sounding result, thereby implementing data transmission in more streams and improving transmission efficiency. In addition, in this case, a new frame does not need to be defined, and an available type remaining in a MAC frame is fully utilized, thereby saving resources.

[0082] According to a thirteenth example, an implementation of this application further provides

a communication apparatus. The communication apparatus may include a processor and a transceiver, and optionally, further includes a memory. When the processor executes a computer program or instructions in the memory, the method according to any one of the implementations of the first example, the second example, the fifth example, the sixth example, the ninth example, or the tenth example is performed.

[0083] According to a fourteenth example, an implementation of this application further provides a computer-readable storage medium. The computer-readable storage medium stores computer instructions. The computer instructions instruct a communication device to perform the method according to any one of the implementations of the first example, the second example, the fifth example, the sixth example, the ninth example, or the tenth example.

[0084] According to a fifteenth example, an implementation of this application further provides a computer program product. The computer program product includes a computer program. When the computer program is run on a computer, the computer is enabled to perform the method according to any one of the implementations of the first example, the second example, the fifth example, the sixth example, the ninth example, or the tenth example.

[0085] According to a sixteenth example, this application further provides a processor, configured to perform any method according to the first example, the second example, the fifth example, the sixth example, the ninth example, or the tenth example. In a process of performing these methods, a process of sending the foregoing information and a process of receiving the foregoing information in the foregoing methods may be understood as a process of outputting the foregoing information by the processor and a process of receiving the foregoing input information by the processor. Specifically, when outputting the information, the processor outputs the information to a transceiver, so that the transceiver transmits the information. Still further, after the information is output by the processor, other processing may further need to be performed on the information before the information arrives at the transceiver. Similarly, when the processor receives the input information, the transceiver receives the information and inputs the information into the processor. Still further, after the transceiver receives the information, other processing may need to be performed on the information before the information is input into the processor.

[0086] In this case, for operations such as transmission, sending, and receiving related to the processor, if there is no particular statement, or if the operations do not contradict an actual function or internal logic of the operations in related descriptions, the operations may be more

generally understood as operations such as output, receiving, and input of the processor, instead of operations such as transmission, sending, and receiving directly performed by a radio frequency circuit and an antenna.

[0087] In a specific implementation process, the processor may be a processor specially configured to perform these methods, or a processor, for example, a general-purpose processor, configured to execute computer instructions in a memory to perform these methods. The memory may be a non-transitory (non-transitory) memory such as a read-only memory (read-only memory, ROM). The memory and the processor may be integrated on a same chip, or may be separately disposed on different chips. A type of the memory and a manner of disposing the memory and the processor are not limited in examples of the present disclosure.

[0088] According to a seventeenth example, this application provides a chip system. The chip system includes a processor and an interface, and is configured to support a communication transmission device in implementing a function in the method according to any one of the first example to the fourth example, for example, determining or processing at least one of data and information in the foregoing method. In a possible design, the chip system further includes a memory. The memory is configured to store information and data that are necessary for the communication apparatus. The chip system may include a chip, or may include a chip and another discrete component.

[0089] According to an eighteenth example, this application provides a functional entity. The functional entity is configured to implement the method according to the first example, the second example, the fifth example, the sixth example, the ninth example, or the tenth aspect.

BRIEF DESCRIPTION OF DRAWINGS

[0090] FIG. 1 is a schematic diagram of a network architecture of a communication system according to an embodiment of this application;

[0091] FIG. 2 is a schematic diagram of a structure of a communication apparatus according to an embodiment of this application;

[0092] FIG. 3 is a schematic diagram of a structure of a chip according to an embodiment of this application;

[0093] FIG. 4A is a schematic diagram of a structure of a VHT NDPA frame according to this

CLAIMS

What is claimed is:

1. A null data packet announcement (NDPA) frame transmission method, comprising:

generating an NDPA frame, wherein the NDPA frame comprises a station information field, and the station information field comprises an association identifier (AID) subfield indicating an AID of a station; the station information field further comprises a partial bandwidth information subfield; the partial bandwidth information subfield comprises a resource unit (RU) indication index, wherein the RU indication index indicates an RU in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information; and a granularity of the RU indicated by the RU indication index comprises at least one of a 242-tone RU, a 484-tone RU, a 996-tone RU, a 484+996-tone RU, a 242+484-tone RU, a 2*996-tone RU, a 2*996+484-tone RU, a 3*996-tone RU, a 3*996+484-tone RU, or a 4*996-tone RU; and

transmitting the NDPA frame.

2. The method according to claim 1, wherein the NDPA frame comprises type information, and the type information indicates that the NDPA frame is an extremely high throughput (EHT) NDPA frame.

3. The method according to claim 1 or 2, wherein the partial bandwidth information subfield comprises a frequency domain indication part and an RU indication part, the frequency domain indication part is used to indicate a frequency domain range in which the RU for which the station needs to feed back channel state information is located, and the RU indication part is used to indicate the RU for which channel state information needs to be fed back.

4. The method according to any one of claims 1 to 3, wherein the station information field comprises four octets.

5. The method according to any one of claims 1 to 4, wherein the partial bandwidth information subfield is nine bits.

6. The method according to any one of claims 1 to 5, wherein the granularity of the RU indicated by the RU indication index is 242-tone RU, the bandwidth corresponding to the NDPA frame is one of 20MHz, 40MHz, 80MHz or 160MHz.

7. The method according to any one of claims 1 to 5, wherein the granularity of the RU indicated by the RU indication index is 484-tone RU, the bandwidth corresponding to the NDPA frame is 320MHz.

8. The method according to claim 7, wherein the partial bandwidth information subfield

comprises eight different RU indication indexes, and the eight different RU indication indexes are used to indicate 484-tone RU at different positions in 320 MHz respectively.

9. The method according to claim 7, wherein the partial bandwidth information subfield comprises four different RU indication indexes, and the four different RU indication indexes are used to indicate 996-tone RU at different positions in 320 MHz respectively.

10. The method according to claim 1, wherein the RU is a 484+996-tone RU, wherein different RU indication indexes indicate different positions of a 484+996-tone RU in a 160 MHz bandwidth, and wherein the 160 MHz bandwidth is the lowest 160 MHz of the 320 MHz or the 160 MHz bandwidth is the highest 160 MHz of the 320 MHz.

11. An NDPA frame transmission method, comprising:

receiving an NDPA frame, wherein the NDPA frame comprises a station information field, and the station information field comprises an AID subfield indicating an association identifier AID of a station; the station information field further comprises a partial bandwidth information subfield; the partial bandwidth information subfield comprises an RU indication index, wherein the RU indication index indicates an RU in a bandwidth corresponding to the NDPA frame and for which the station needs to feed back channel state information; and a granularity of the RU indicated by the RU indication index comprises at least one of a 242-tone RU, a 484-tone RU, a 996-tone RU, a 484+996-tone RU, a 242+484-tone RU, a 2*996-tone RU, a 2*996+484-tone RU, a 3*996-tone RU, a 3*996+484-tone RU, or a 4*996-tone RU; and

obtaining from the NDPA frame, the RU for which channel state information needs to be fed back.

12. The method according to claim 11, wherein the NDPA frame comprises type information, and the type information indicates that the NDPA frame is an extremely high throughput (EHT) NDPA frame.

13. The method according to claim 11 or 12, wherein the partial bandwidth information subfield comprises a frequency domain indication part and an RU indication part, the frequency domain indication part is used to indicate a frequency domain range in which the RU for which the station needs to feed back channel state information is located, and the RU indication part is used to indicate the RU for which channel state information needs to be fed back.

14. The method according to any one of claims 11 to 13, wherein the station information field comprises four octets.

15. The method according to any one of claims 11 to 14, wherein the partial bandwidth information subfield is nine bits.

16. The method according to any one of claims 11 to 15, wherein the granularity of the RU

indicated by the RU indication index is 242-tone RU, the bandwidth corresponding to the NDPA frame is one of 20MHz, 40MHz, 80MHz or 160MHz.

17. The method according to any one of claims 11 to 15, wherein the granularity of the RU indicated by the RU indication index is 484-tone RU, the bandwidth corresponding to the NDPA frame is 320MHz.

18. The method according to claim 17, wherein the partial bandwidth information subfield comprises eight different RU indication indexes, and the eight different RU indication indexes are used to indicate 484-tone RU at different positions in 320 MHz respectively.

19. The method according to claim 17, wherein the partial bandwidth information subfield comprises four different RU indication indexes, and the four different RU indication indexes are used to indicate 996-tone RU at different positions in 320 MHz respectively.

20. The method according to claim 11, wherein the RU is a 484+996-tone RU, wherein different RU indication indexes indicate different positions of a 484+996-tone RU in a 160 MHz bandwidth, and wherein the 160 MHz bandwidth is the lowest 160 MHz of the 320 MHz or the 160 MHz bandwidth is the highest 160 MHz of the 320 MHz.

21. A communication apparatus, comprising a processor and a memory, wherein the memory is configured to store instructions; and when the processor runs the instructions, the communication apparatus is enabled to perform the method according to any one of claims 1 to 20.

22. A computer-readable storage medium, wherein the computer-readable storage medium stores computer instructions, and the computer instructions instruct a communication device to perform the method according to any one of claims 1 to 20.

23. A computer program product, wherein the computer program product comprises a computer program; and when the computer program is run on a computer, the computer is enabled to perform the method according to any one of claims 1 to 20.