

INFORMATION INDICATION METHOD AND APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202110185134.5, filed with the China National Intellectual Property Administration on February 10, 2021 and
5 entitled "INFORMATION INDICATION METHOD AND APPARATUS", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the field of wireless communication technologies, and in particular, to an information indication method and apparatus.

BACKGROUND

[0003] The wireless local area network (wireless local area network, WLAN) standard starts from 802.11a/b/g and goes through 802.11n, 802.11ac, and 802.11ax. The WLAN standards define a signaling format of a physical layer protocol data unit (PHY protocol data unit, PPDU). However, in practice, Vendor private design or vendor specific design may be performed on the PPDU. As a
10 result, the PPDU may carry some vendor specific information. The vendor private design performed on the PPDU may conflict with PPDU information defined in the WLAN standard.

SUMMARY

[0004] Embodiments of this application provide an information indication method and apparatus, a chip, a computer-readable storage medium, a computer program product, and the like,
20 to resolve a problem that vendor private design performed on a PPDU may conflict with PPDU information defined in a WLAN standard.

[0005] According to a first aspect, an embodiment of this application provides an information indication method. The method may be applied to a communication device, or a chip or a chipset

in a communication device. The method includes: A first device generates and sends a physical layer protocol data unit PPDU, where a first field in a signaling field of the PPDU is in a first value state, the first value state indicates that the PPDU carries vendor specific information, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state.

[0006] In this embodiment of this application, one or more states of the any value state of the disregard bit, the non-default state of the validate bit, the disregard state, and the validate state are used as an identifier of the vendor specific information. In other words, when the first field in the signaling field of the PPDU is in the first value state, a device that supports a transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" can read the PPDU in the first value state, and obtain the vendor specific information from the PPDU. The transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may be referred to as a first transmission mechanism, and details are not described below again. In the foregoing manner, PPDU information defined in an original standard does not conflict with PPDU information defined during vendor privatization customization or subsequent standard improvement.

[0007] In a possible design, the first field includes a PPDU type and compression mode subfield and a non-orthogonal frequency division multiple access (orthogonal frequency division multiple access, OFDMA) transmission user quantity subfield. The first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

[0008] In the foregoing design, that the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that the quantity of the users participating in non-OFDMA transmission is greater than 1 is used as the validate state or the disregard state. The PPDU type and the compression mode subfield indicates single-user transmission. A state in which the user quantity of non-OFDMA transmission is indicated to exceed 1 is considered as an identifier of the vendor specific information. A receive end that supports a transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may determine that the PPDU carries an identifier of the vendor

specific information. A corresponding quantity of user fields appear subsequently based on indication of the user quantity of non-OFDMA. The vendor specific information is read from these user fields. A receive end that does not support the transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may use, as the validate state or the disregard state, that the PPDU type and compression mode subfield indicates single-user transmission and a non-OFDMA transmission user quantity subfield indicates that the quantity of users participating in non-OFDMA transmission is greater than 1 for processing. In this manner, vendor privatization customization can be implemented without changing the PPDU information defined in a WLAN standard.

[0009] In a possible design, the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different. According to the foregoing design, the first device may identify the vendor specific information by using the first value state, and add the modulation schemes of the N spatial streams in the unequal modulation scheme to the PPDU.

[0010] In a possible design, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates a total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of 2nd to Nth spatial streams. In the foregoing design, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is n. The PPDU may correspondingly include the n user fields. Modulation schemes of the N spatial streams may be indicated by using the n user fields.

[0011] In a possible design, a station identifier subfield in the 1st user field indicates the identifier of the target station. A spatial stream indication subfield in the 1st user field indicates the total number N of the spatial streams. A modulation and coding scheme MCS indication subfield in the 1st user field indicates the modulation scheme of the 1st spatial stream. In the foregoing design, the 1st user field may use a signaling format of a user field defined in a WLAN standard, so that a change to the WLAN standard is small.

[0012] In a possible design, the 2nd to Nth spatial streams in the N spatial streams are divided into the K spatial stream groups. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a

1st user field in the n user fields indicates the total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of the K spatial stream groups, where K is an integer, and $1 \leq K \leq N-1$.

[0013] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq H$. The PPDU includes n user fields, where the n user fields include a first user field. The first user field indicates the total quantity H of the spatial stream groups and a number of spatial streams in each of the H spatial stream groups. n-1 user fields in the n user fields other than the first user field indicate a modulation scheme of each of the H spatial stream groups. In the foregoing design, the first user field may indicate grouping information of the spatial streams, so that flexibility of grouping the spatial streams can be improved.

[0014] In a possible design, a station identifier of the first user field is a specific value.

[0015] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq H$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates the total quantity H of spatial stream groups, an identifier of a target station, and a modulation scheme of the 1st spatial stream group. 2nd to nth user fields indicate modulation schemes of 2nd to nth spatial stream groups. In the foregoing design, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is n. The PPDU may correspondingly include the n user fields. Modulation schemes of the H spatial stream groups may be indicated by using the n user fields.

[0016] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a user quantity is H. The PPDU includes H user fields. An ith user field in the H user fields indicates a modulation scheme of an ith spatial stream group in the H spatial stream groups and a number of spatial streams in each of the H spatial stream groups. i is an integer, and $1 \leq i \leq H$. In the foregoing design, one user field indicates a modulation scheme of one spatial stream group. Therefore, the total quantity H of the spatial stream groups may be indicated by using the user quantity indicated by the non-OFDMA transmission user quantity subfield, so that signaling overheads can be reduced.

[0017] In a possible design, an MCS indication subfield in the i^{th} user field indicates a modulation scheme of the i^{th} spatial stream group. A spatial stream allocation subfield in the i^{th} user field indicates the number of the spatial streams in each of the H spatial stream groups. In the foregoing design, the user field may use a signaling format that is of a user field used for MU-MIMO user transmission and that is defined in a WLAN standard, so that a change to the WLAN standard is small.

[0018] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a user quantity is H . The PPDU includes H user fields. An i^{th} user field in the H user fields indicates a modulation scheme of an i^{th} spatial stream group in the H spatial stream groups and a number of spatial streams in the i^{th} spatial stream group. i is an integer, and $1 \leq i \leq H$. In the foregoing design, one user field indicates a modulation scheme of one spatial stream group. Therefore, the total quantity H of the spatial stream groups may be indicated by using the user quantity indicated by the non-OFDMA transmission user quantity subfield, so that signaling overheads can be reduced.

[0019] In a possible design, an MCS indication subfield in the i^{th} user field indicates a modulation scheme of the i^{th} spatial stream group. A spatial stream indication subfield in the i^{th} user field indicates the number of the spatial streams in the i^{th} spatial stream group. In the foregoing design, the user field may use a signaling format that is of a user field used for non-MU-MIMO user transmission and that is defined in a WLAN standard, so that a change to the WLAN standard is small.

[0020] In a possible design, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n . The PPDU includes N user fields. A j^{th} user field in the N user fields indicates a modulation scheme of a j^{th} spatial stream of the N spatial streams. j is an integer, and $1 \leq j \leq N$.

[0021] In a possible design, the first field includes a user field. The first value state is indicated by using a second validate state. The second validate state is that a value of a station identifier subfield in the user field is a specific value. In the foregoing design, a user field whose station identifier is a specific value may be used as an identifier of the vendor specific information.

[0022] In a possible design, the first value state is a validate state defined in a WLAN standard. For example, the first value state may be one or more validate states defined in the 802.11be

standard.

[0023] In a possible design, the first value state may also be indicated by using a validate state defined in a WLAN standard and a validate bit defined in the WLAN standard. For example, the first value state may be indicated by using a validate state and a validate bit defined in the 802.11be

standard.

[0024] According to a second aspect, an embodiment of this application provides an information indication method. The method may be applied to a communication device, or a chip or a chipset in a communication device. The method includes: A second device receives a physical layer protocol data unit PPDU, where a first field in a signaling field of the PPDU is in a first value state, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state; if the second device supports a first transmission mechanism, the second device obtains vendor specific information from the PPDU, where the first transmission mechanism is that the first value state indicates that the PPDU carries the vendor specific information; or if the second device does not support a first transmission mechanism, the second device uses the first value state as the validate state or the disregard state to process the PPDU.

[0025] In this embodiment of this application, one or more states of the any value state of the disregard bit, the non-default state of the validate bit, the disregard state, and the validate state are used as an identifier of the vendor specific information, so that a device supporting the first transmission mechanism can read the PPDU in the first value state, and obtain the vendor specific information from the PPDU. In the foregoing manner, PPDU information defined in an original standard does not conflict with PPDU information defined during vendor privatization customization or subsequent standard improvement.

[0026] In a possible design, the first field includes a PPDU type and compression mode subfield and a non-OFDMA transmission user quantity subfield. The first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

[0027] In the foregoing design, that the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that

the quantity of the users participating in non-OFDMA transmission is greater than 1 is used as the validate state or the disregard state. The PPDU type and the compression mode subfield indicates single-user transmission. A state in which the user quantity of non-OFDMA transmission is indicated to exceed 1 is considered as an identifier of the vendor specific information. A receive end that supports a transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may determine that the PPDU carries an identifier of the vendor specific information. A corresponding quantity of user fields appear subsequently based on indication of the user quantity of non-OFDMA. The vendor specific information is read from these user fields. A receive end that does not support the transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may use, as the validate state or the disregard state, that the PPDU type and compression mode subfield indicates single-user transmission and a non-OFDMA transmission user quantity subfield indicates that the quantity of users participating in non-OFDMA transmission is greater than 1 for processing. In this manner, vendor privatization customization can be implemented without changing the PPDU information defined in a WLAN standard.

[0028] In a possible design, the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different. According to the foregoing design, the first device may identify the vendor specific information by using the first value state, and add the modulation schemes of the N spatial streams in the unequal modulation scheme to the PPDU.

[0029] In a possible design, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates the total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of 2nd to Nth spatial streams. In the foregoing design, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is n. The PPDU may correspondingly include the n user fields. Modulation schemes of the N spatial streams may be indicated by using the n user fields.

[0030] In a possible design, a station identifier subfield in the 1st user field indicates the identifier of the target station. A spatial stream indication subfield in the 1st user field indicates the total number N of the spatial streams. A modulation and coding scheme MCS indication subfield

in the 1st user field indicates the modulation scheme of the 1st spatial stream. In the foregoing design, the 1st user field may use a signaling format of a user field defined in a WLAN standard, so that a change to the WLAN standard is small.

[0031] In a possible design, the 2nd to Nth spatial streams in the N spatial streams are divided into the K spatial stream groups. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates the total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of the K spatial stream groups, where K is an integer, and $1 \leq K \leq N-1$.

[0032] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq H$. The PPDU includes n user fields, where the n user fields include a first user field. The first user field indicates the total quantity H of the spatial stream groups and a number of spatial streams in each of the H spatial stream groups. n-1 user fields in the n user fields other than the first user field indicate a modulation scheme of each of the H spatial stream groups. In the foregoing design, the first user field may indicate grouping information of the spatial streams, so that flexibility of grouping the spatial streams can be improved.

[0033] In a possible design, a station identifier of the first user field is a specific value.

[0034] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq H$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates the total quantity H of spatial stream groups, an identifier of a target station, and a modulation scheme of the 1st spatial stream group. 2nd to nth user fields indicate modulation schemes of 2nd to Hth spatial stream groups. In the foregoing design, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is n. The PPDU may correspondingly include the n user fields. Modulation schemes of the H spatial stream groups may be indicated by using the n user fields.

[0035] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a user quantity is H. The PPDU includes H user fields. An ith user field in the H user fields

indicates a modulation scheme of an i^{th} spatial stream group in the H spatial stream groups and a number of spatial streams in each of the H spatial stream groups. i is an integer, and $1 \leq i \leq H$. In the foregoing design, one user field indicates a modulation scheme of one spatial stream group. Therefore, the total quantity H of the spatial stream groups may be indicated by using the user quantity indicated by the non-OFDMA transmission user quantity subfield, so that signaling overheads can be reduced.

[0036] In a possible design, an MCS indication subfield in the i^{th} user field indicates a modulation scheme of the i^{th} spatial stream group. A spatial stream allocation subfield in the i^{th} user field indicates the number of the spatial streams in each of the H spatial stream groups. In the foregoing design, the user field may use a signaling format that is of a user field used for MU-MIMO user transmission and that is defined in a WLAN standard, so that a change to the WLAN standard is small.

[0037] In a possible design, the N spatial streams are divided into H spatial stream groups, where H is an integer, and $1 < H \leq N$. The non-OFDMA transmission user quantity subfield indicates that a user quantity is H . The PPDU includes H user fields. An i^{th} user field in the H user fields indicates a modulation scheme of an i^{th} spatial stream group in the H spatial stream groups and a number of spatial streams in the i^{th} spatial stream group. i is an integer, and $1 \leq i \leq H$. In the foregoing design, one user field indicates a modulation scheme of one spatial stream group. Therefore, the total quantity H of the spatial stream groups may be indicated by using the user quantity indicated by the non-OFDMA transmission user quantity subfield, so that signaling overheads can be reduced.

[0038] In a possible design, an MCS indication subfield in the i^{th} user field indicates a modulation scheme of the i^{th} spatial stream group. A spatial stream indication subfield in the i^{th} user field indicates the number of the spatial streams in the i^{th} spatial stream group. In the foregoing design, the user field may use a signaling format that is of a user field used for non-MU-MIMO user transmission and that is defined in a WLAN standard, so that a change to the WLAN standard is small.

[0039] In a possible design, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n . The PPDU includes N user fields. A j^{th} user field in the N user fields indicates a modulation scheme of a j^{th} spatial stream of the N spatial streams. j is an integer, and $1 \leq j \leq N$.

[0040] In a possible design, the first field includes a user field. The first value state is indicated by using the following validate state or disregard state. The second validate state is that a value of a station identifier subfield in the user field is a specific value. In the foregoing design, a user field whose station identifier is a specific value may be used as an identifier of the vendor specific information.

[0041] In a possible design, the first value state is a validate state defined in a WLAN standard. For example, the first value state may be one or more validate states defined in the 802.11be standard.

[0042] In a possible design, the first value state may also be indicated by using a validate state defined in a WLAN standard and a validate bit defined in the WLAN standard. For example, the first value state may be indicated by using a validate state and a validate bit defined in the 802.11be standard.

[0043] According to a third aspect, this application provides an information indication apparatus. The apparatus may be a communication device, or may be a chip or a chipset in a communication device. The communication device may be an access point (access point, AP), or may be a station (station, STA). The apparatus may include a processing unit and a transceiver unit. When the apparatus is the communication device, the processing unit may be a processor, and the transceiver unit may be a transceiver. The apparatus may further include a storage module, and the storage module may be a memory. The storage module is configured to store instructions.

The processing unit executes the instructions stored in the storage module, to perform the corresponding method in any one of the first aspect or the designs of the first aspect. Alternatively, the processing unit executes the instructions stored in the storage module, to perform the corresponding method in any one of the second aspect or the designs of the second aspect. When the apparatus is the chip or the chipset in the communication device, the processing unit may be a processor, and the transceiver unit may be an input/output interface, a pin, a circuit, or the like. The processing unit executes instructions stored in a storage module, to perform the corresponding method in any one of the first aspect or the designs of the first aspect. Alternatively, the processing unit executes the instructions stored in the storage module, to perform the corresponding method in any one of the second aspect or the designs of the second aspect. The storage module may be a storage module (for example, a register or a cache) in the chip or the chipset, or may be a storage module (for example, a read-only memory or a random access memory) that is in a network device

and that is located outside the chip or the chipset.

[0044] According to a fourth aspect, an information indication apparatus is provided, including a processor, a communication interface, and a memory. The communication interface is configured to transmit information, and/or a message, and/or data between the apparatus and another apparatus.

5 The memory is configured to store computer-executable instructions. When the apparatus runs, the processor executes the computer-executable instructions stored in the memory, so that the apparatus performs the method according to any one of the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

[0045] According to a fifth aspect, this application further provides a computer-readable storage medium. The computer-readable storage medium stores instructions, and when the instructions are run on a computer, the computer is enabled to perform the method according to the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

[0046] According to a sixth aspect, this application further provides a computer program product that includes instructions. When the computer program product runs on a computer, the computer is enabled to perform the method according to the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

[0047] According to a seventh aspect, this application further provides a network system. The network system includes a first device and a second device. The first device may perform the corresponding method according to any one of the first aspect or the designs of the first aspect, and the second device may perform the method according to any one of the second aspect or the designs of the second aspect.

[0048] According to an eighth aspect, an embodiment of this application provides a chip. The chip includes a memory, at least one processor and communication interface. The processor is coupled to the memory, and is configured to read a computer program stored in the memory, to perform the method according to any one of the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

[0049] According to a ninth aspect, an embodiment of this application provides a chip, including a communication interface and at least one processor. The processor runs to perform the method according to any one of the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

[0050] According to a tenth aspect, this application further provides a communication apparatus. The communication apparatus is configured to implement the method according to any one of the first aspect or the designs of the first aspect, or any one of the second aspect or the designs of the second aspect.

5 **[0051]** It should be noted that "coupling" in embodiments of this application indicates a direct combination or an indirect combination of two components.

BRIEF DESCRIPTION OF DRAWINGS

[0052] FIG. 1 is a schematic diagram of an architecture of a WLAN network according to an embodiment of this application;

10 **[0053]** FIG. 2 is a schematic flowchart of an information indication method according to an embodiment of this application;

[0054] FIG. 3 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0055] FIG. 4A is a schematic diagram of a format of a PPDU according to an embodiment of
15 this application;

[0056] FIG. 4B is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0057] FIG. 5 is a schematic diagram of a signaling format of negotiation information according to an embodiment of this application;

20 **[0058]** FIG. 6 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0059] FIG. 7 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0060] FIG. 8 is a schematic diagram of a format of a special user field according to an
25 embodiment of this application;

[0061] FIG. 9 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0062] FIG. 10 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0063] FIG. 11 is a schematic diagram of a format of a PPDU according to an embodiment of this application;

[0064] FIG. 12 is a schematic diagram of a structure of an information indication apparatus according to an embodiment of this application; and

5 **[0065]** FIG. 13 is a schematic diagram of a structure of an information indication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[0066] To make the embodiments of this application more understandable, the following first explains some descriptions in the embodiments of this application. These explanations shall not
10 be considered as a limitation on the protection scope required by the present invention.

[0067] Vendor specific information (vendor specific information): Vendor specific information is information required by vendors for privatization design.

[0068] Disregard bit, validate bit, disregard state, and validate state: In a WLAN standard, reserved/unused bits (reserved bits) are classified into two types: disregard (Disregard) bit and
15 validate (Validate) bit. Reserved/unused states of a field (or subfield) are classified into two types: disregard state, and validate state.

[0069] If a PPDU meets at least one of the following two conditions, the device may wait until the PPDU ends, transfer information in a version independent field of the PPDU to a media access control (medium access control, MAC) layer to ensure coexistence, and terminate receiving of the
20 PPDU: (1) A validate bit in the PPDU is not set to a default (or default) value specified in the standard; and (2) values of some subfields in the PPDU are set to a validate state. For a disregard bit or a subfield set to a disregard state, if the validate bit of the PPDU is set to the default (or default) value specified in the standard, and there is no subfield set to the validate state, a device may ignore the disregard bit, or ignore the subfield set to the disregard state, and continue to read
25 other fields.

[0070] For example, in a universal signal field (universal signal field, U-SIG) field of the PPDU, there are five disregard bits and three validate bits. Four disregard bits are included in a U-SIG overflow part of an extreme high throughput signal field (extreme high throughput signal field, EHT-SIG). The validate state exists in joint indication of a PPDU type and compression mode

subfield and an uplink/downlink subfield. For example, when any one of the validate bits is a non-default value (or a non-default value), the device may wait until the PPDU ends, transfer information in the version independent field of the PPDU to the MAC layer, and terminate receiving of the PPDU. For another example, when the joint indication of the PPDU type and compression mode subfield and the uplink/downlink subfield is the validate state, the device may transfer information in the version independent field of the PPDU to the MAC layer after the PPDU ends, to ensure coexistence and terminate receiving of the PPDU. If the validate bit in the PPDU is the default value and there is no subfield set to the validate state, the device may ignore the disregard bit or the subfield set to the disregard state, and continue to receive other fields.

[0071] Space-time stream (Space-Time Stream) and spatial stream (Spatial Stream): Space-time block coding (space-time block coding, STBC) in different spatial streams and time dimensions is considered for a space-time stream. When a transmit end does not use STBC, the space-time stream may also be referred to as the spatial stream. For ease of description, the space-time stream and the spatial stream are uniformly referred to as the spatial stream in embodiments of this application.

[0072] Equal modulation: Equal modulation indicates that modulation schemes of all spatial streams are the same.

[0073] Unequal modulation: Unequal modulation indicates that modulation schemes of different spatial streams may be different.

[0074] To make objectives, technical solution, and advantages of embodiments of this application clearer, the following further describes embodiments of this application in detail with reference to the accompanying drawings.

[0075] Embodiments of this application may be applied to a scenario of a wireless local area network (wireless local area network, WLAN); and may be applied to an IEEE 802.11 system standard, for example, an IEEE 802.11ax standard, or a next-generation standard or a further next-generation standard. Alternatively, the embodiments of this application may be applied to a wireless local area network system, for example, an Internet of things (internet of things, IoT) or an Internet of vehicles (Vehicle to X, V2X). Certainly, embodiments of this application may be further applicable to another possible communication system, for example, a long term evolution (long term evolution, LTE) system, an LTE frequency division duplex (frequency division duplex, FDD) system, an LTE time division duplex (time division duplex, TDD) system, a universal

mobile telecommunications system (universal mobile telecommunications system, UMTS), a worldwide interoperability for microwave access (worldwide interoperability for microwave access, WiMAX) communication system, a 5G communication system, and a future communication system such as a 6G communication system.

5 **[0076]** An application scenario of embodiments of this application may be communication between an AP and one or more STAs, and is also applicable to communication between APs and communication between STAs. For example, FIG. 1 is a diagram of a network architecture of a WLAN to which embodiments of this application are applicable. In FIG. 1, an example in which the WLAN includes two APs: an AP 1 and an AP 2, a STA 1 and a STA 2 that are associated with
10 the AP 1, and a STA 3 connected to the STA 2 is used. The AP 1 may communicate with the STA 1 and the STA 2, the AP 1 and the AP 2 may communicate with each other, and the STA 2 and the STA may communicate with each other. It should be understood that quantities of APs and STAs in FIG. 1 are merely an example. There may be more or less APs and STAs.

[0077] The STA in this embodiment of this application may be various user terminals, user
15 apparatuses, access apparatuses, subscriber stations, subscriber units, mobile stations, user agents, user equipment, or the like in another name that have a wireless communication function. The user terminal may include various handheld devices, vehicle-mounted devices, wearable devices, computing devices, or other processing devices connected to a wireless modem that have a wireless communication function; and various forms of user equipment (user equipment, UE), mobile
20 stations (mobile station, MS), terminals (terminal), terminal equipment (terminal equipment), portable communication devices, handheld devices, portable computing devices, entertainment devices, game devices or systems, global positioning system devices or any other proper devices configured to perform network communication by using a wireless medium, and the like. Herein, for ease of description, the devices mentioned above are collectively referred to as stations or STAs.

25 **[0078]** The AP in this embodiment of this application is an apparatus that is deployed in a wireless communication network and that provides a wireless communication function for a STA associated with the AP. The AP may be used as a hub of the communication system, and may be a communication device such as a base station, a router, a gateway, a repeater, a communication server, a switch, or a bridge. The base station may include various forms of macro base stations,
30 micro base stations, relay stations, and the like. Herein, for ease of description, the devices mentioned above are collectively referred to as access points APs. Specifically, the AP and the STA

in this application may be an AP and a STA to which an IEEE 802.11 system standard is applicable.

[0079] In the embodiments of this application, "at least one" means one or more, and "a plurality of" means two or more. The term "and/or" describes an association relationship between associated objects and indicates that three relationships may exist. For example, A and/or B may indicate the following three cases: Only A exists, both A and B exist, and only B exists. A and B each may be singular or plural. The character "/" generally indicates an "or" relationship between the associated objects. 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 items (pieces). For example, at least one of a, b, or c may indicate a, b, c, a and b, a and c, b and c, or a, b, and c, where a, b, and c may be singular or plural.

[0080] In addition, unless otherwise stated, ordinal numbers such as "first" and "second" in the embodiments of this application are used to distinguish between a plurality of objects, and are not intended to limit sizes, content, an order, a time sequence, priorities, or importance degrees of the plurality of objects. For example, a first data packet and a second data packet are merely names given for ease of description, and the two data packets may be a same data packet, or may be different data packets.

[0081] The following describes in detail embodiments of this application with reference to the accompanying drawings.

[0082] This application provides an information indication method. The method may be applied to a WLAN system, for example, the WLAN system shown in FIG. 1. As shown in FIG. 2, the method includes the following steps.

[0083] S201: A first device generates a PPDU, where a first field in a signaling field of the PPDU is in a first value state, the first value state indicates that the PPDU carries vendor specific information, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state.

[0084] For example, the vendor specific information may include but is not limited to: modulation schemes of N spatial streams in an unequal modulation scheme, where modulation schemes of at least two of the N spatial streams are different, and N is an integer greater than 1; HARQ information; information indicating AP coordination; and the like. Vendors can design the vendor specific information based on requirements, which is not listed here.

[0085] It should be noted that the first field may include one or more fields. This is not limited in this application.

[0086] Optionally, the PPDU may be in a format of an extreme high throughput multiple user physical layer protocol data unit (extreme high throughput multiple user physical layer protocol data unit, EHT MU PPDU). For example, as shown in FIG. 3, the PPDU may include a preamble part, a data (Data) field, and data packet extension (packet extension, PE). The preamble part includes a legacy preamble, for example, a legacy short training field (legacy short training field, L-STF), a legacy long training field (legacy long training field, L-LTF), or a legacy signaling field (legacy signaling field, L-SIG). The legacy preamble can ensure coexistence of a new device and a legacy device. The L-SIG may include a length field, and may indirectly indicate duration of a field following the L-SIG in the PPDU. In addition, the L-SIG may further include repetition of the legacy signaling field, to enhance reliability of the legacy signaling field. In addition, the L-SIG may further provide features that enable a receive end to detect whether two symbols are the same, a remainder of a length in the L-SIG, and the like, so that the receive end identifies that the PPDU is an EHT PPDU.

[0087] Optionally, the preamble part may further include a repeat legacy signaling field (repeat legacy signaling field, RL-SIG). The RL-SIG may be an RL-SIG field defined in the 802.11ax.

[0088] In addition, the preamble part may further include U-SIG, and the U-SIG may indicate version information of the PPDU. If the PPDU is the EHT MU PPDU, the EHT-SIG may be further present after the U-SIG. The U-SIG and the EHT-SIG may carry signaling information for demodulating a subsequent data field.

[0089] As shown in Table 1, the following describes an example of a U-SIG overflow (Overflow) subfield in a common part of the U-SIG and the EHT-SIG.

Table 1

Field	Category	Subfield	Bit	Description
U-SIG	Version independent (version independent)	Physical layer version identifier (version identifier) subfield	3	Indicate a version of a PPDU
		PPDU bandwidth (bandwidth, BW)	3	Indicate a bandwidth of a PPDU

Field	Category	Subfield	Bit	Description
		subfield		
		Uplink (uplink, UL)/Downlink (downlink, DL) subfield	1	Uplink/Downlink indication
		Basic service set color (BSS color) subfield	6	Indicate a color identifier of a basic service set (basic service set, BSS) in which a cell is located, which is equivalent to identification information of the cell
		Transmit opportunity (TXOP) subfield	7	Indicate a transmit opportunity (transmit opportunity, TXOP)
	Version dependent (version dependent)	Disregard (disregard) bit	5	Disregard-reserved bit
		Validate (validate) bit	1	Validate-reserved bit, where a default value is 1
		Punctured channel indication (punctured channel indication) subfield	5	Indicate a punctured channel
		Validate (validate) bit	1	Validate-reserved bit, where a default value is 1, and it may be used as extension of punctured channel indication
		PPDU type and compression mode (PPDU type and compression mode) subfield	2	Indicate a PPDU type and a compression mode
		Validate bit	1	Validate-reserved bit, where a default value is 1, and it may be

Field	Category	Subfield	Bit	Description
				used as extension of a PPDU type and a compression mode
		EHT-SIG modulation and coding scheme (EHT-SIG MCS) subfield	2	Indicate a modulation and coding scheme of an EHT-SIG
		Number of EHT-SIG symbols (number of EHT-SIG symbols) subfield	5	Indicate a number of EHT-SIG symbols
	Cyclic redundancy check (cyclic redundancy check, CRC) & tail bit (tail)	CRC in U-SIG (CRC in U-SIG)	4	Used to check U-SIG information
		Tail in U-SIG (tail in U-SIG)	6	Tail bit, used to end coding
EHT-SIG	Version dependent (version dependent) (U-SIG overflow)	Spatial reuse (spatial reuse) subfield	4	Spatial reuse
		Guard interval+long training field size (size) subfield	2	Indicate a guard interval (guard interval, GI) and a long training field (long training field, LTF) size
		Number of EHT-LTF symbols (Number of EHT-LTF symbols) subfield	3	Indicate a number of EHT-LTF symbols
		LDPC extra symbol segment (LDPC extra symbol segment) subfield	1	Indicate whether an extra symbol segment is transmitted after low density parity check (low density parity check, LDPC) coding
		Pre-FEC padding (Pre-FEC padding) subfield	2	Indicate a pre-forward error Correction (Forward Error Control, FEC) padding factor

Field	Category	Subfield	Bit	Description
		PE disambiguity (disambiguity) subfield	1	Indicate whether data packet extension is ambiguous
		Disregard (disregard) bit	4	Disregard-reserved bit

[0090] The following describes an example of the uplink/downlink subfield and the PPDU type and compression mode subfield in a U-SIG field, as shown in Table 2.

Table 2

U-SIG field		Description				
Uplink/Downlink	PPDU type and compression mode	PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
0 (downlink)	0	EHT MU	Yes	Yes	≥ 1	DL OFDMA, including non-multiple user multiple input multiple output (multiple user multiple input multiple output, MU-MIMO) and MU-MIMO
	1	EHT MU	Yes	No	1	Single user (single user,

U-SIG field		Description				
Uplink/Downlink	PPDU type and compression mode	PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
						SU) or null data packet (null data packet, NDP) (not sent to an access point AP, usually refers to downlink)
	2	EHT MU	Yes	No	> 1	DL MU-MIMO (non-OFDMA transmission)
	3	-	-	-	-	Validate state
1 (uplink)	0	EHT TB (trigger based, based on triggering)	No	-	≥ 1	UL OFDMA (including non-MU-MIMO and MU-MIMO)
	1	EHT MU	Yes	No	1	SU or NDP (sent to an AP, that is, uplink)
	2-3	-	-	-	-	Validate state

[0091] Optionally, in addition to the U-SIG overflow (Overflow) subfield, the EHT-SIG may further include another field. For example, fields included in the EHT-SIG may be shown in Table

3.

Table 3

Field	Category	Subfield	Bit	Description
EHT-SIG	Version dependent (version dependent)	U-SIG overflow	Refer to table 1	
	Common part of the EHT-SIG other than U-SIG overflow	Quantity of non-OFDMA transmission users	3	Indicate the quantity of users participating in non-OFDMA transmission, which is set to 0 during single-user transmission, indicating one user
	User field for non-MU-MIMO transmission	Station identifier	11	Indicate identifier information of a station
		Modulation and coding scheme	4	Indicate a modulation and coding scheme 0: binary phase shift keying (binary phase shift keying, BPSK), bit rate (rate, R)=1/2 1: quadrature phase shift keying (quadrature phase shift keying, QPSK), R=1/2 2: QPSK, R=3/4 3: 16-quadrature amplitude modulation (quadrature amplitude modulation, QAM), R=1/2 4: 16-QAM, R=3/4 5: 64-QAM, R=2/3 6: 64-QAM, R=3/4 7: 64-QAM, R=5/6 8: 256-QAM, R=3/4 9: 256-QAM, R=5/6

Field	Category	Subfield	Bit	Description
				10: 1024-QAM, R=3/4 11: 1024-QAM, R=5/6 12: 4096-QAM, R=3/4 13: 4096-QAM, R=5/6 14: BPSK, dual-carrier modulation, repetition, R=1/2 15: BPSK, dual-carrier modulation, R=1/2
		Reserved	1	Reserved, where a default value can be 1 If a station identifier is matched, this field can be a validate field. If a station identifier is not matched, this field can be a disregard field.
		NSS	4	Indicate a number of spatial streams
		Beamforming (beamformed)	1	Indicate whether beamforming is used.
		Coding (Coding)	1	Indicate whether a coding scheme is binary convolution code (binary convolution code, BCC) or low density parity check (low density parity check, LDPC) code
	CRC & tail	CRC	4	Used to check the common part and a user field in the EHT-SIG
		Tail	6	Tail bit, used to end coding

[0092] Optionally, the quantity of the non-OFDMA transmission users may also be a subfield of the U-SIG overflow field.

[0093] It should be noted that the subfields included in the EHT-SIG and the corresponding quantities of bits shown in Table 3 are merely examples for description, and are not specifically limited.

[0094] The preamble part may further include an extreme high throughput short training field (extreme high throughput short training field, EHT-STF) and an extreme high throughput long

training field (extreme high throughput long training field, EHT-LTF). In the preamble part, the EHT-STF may be used for automatic gain control, and the EHT-LTF may be used for channel estimation.

[0095] The data packet extension provides more time for a receiver to process data.

5 **[0096]** S202: The first device sends the PPDU. Correspondingly, a second device receives the PPDU.

[0097] S203: If the second device supports a first transmission mechanism, the second device obtains the vendor specific information from the PPDU, where the first transmission mechanism is that the first value state indicates that the PPDU carries the vendor specific information; or if
10 the second device does not support a first transmission mechanism, the second device processes the PPDU by using the first value state as the validate state or the disregard state.

[0098] If the second device may support the transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information", the second device may determine, when the PPDU is in the first value state, that the PPDU carries the vendor specific information,
15 and obtain the vendor specific information. If the second device does not support the transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information", the second device cannot read the PPDU in the first value state, and therefore cannot obtain the vendor specific information. To be specific, a value state (that is, the first value state) of the first field in the PPDU signaling field indicates whether the PPDU carries the vendor specific
20 information. If the second device supports the mechanism in which the first value state indicates that the PPDU carries the vendor specific information, after receiving the PPDU, the second device finds that the first field of the PPDU is in the first value state. In this way, the second device considers that the PPDU carries the related vendor specific information, and obtains the vendor specific information. On the contrary, if the second device does not support the mechanism in
25 which the first value state indicates that the PPDU carries the vendor specific information, after receiving the PPDU, the second device finds that the first field of the PPDU is in the first value state. In this way, the second device cannot read the PPDU, and therefore cannot obtain the vendor specific information.

[0099] It may be understood that the validate state or the disregard state indicates the first
30 value state, and the first value state is also used as an identifier of the vendor specific information. For a device that supports such vendor specific information, the first value state is not processed

as the validate state or the disregard state, but specific vendor specific information is further acquired based on the first value state. For a device that does not support such vendor specific information, the first value state is used as the validate state or the disregard state, that is, receiving of the PPDU is terminated, or a field of the disregard state is ignored, and other fields are further
5 read.

[00100] Optionally, before step S202, the first device and the second device may exchange information, to determine whether the peer party supports or does not support the first transmission mechanism. For example, the first device and the second device may interact in an association phase. For example, the STA sends an association request frame, where the association request
10 frame includes indication indicating whether the STA supports the first transmission mechanism. The AP sends an association response frame, where the association response frame includes indication indicating whether the AP supports the first transmission mechanism. The STA may be the first device, and the AP may be the second device. Alternatively, the STA is the second device, and the AP is the first device.

[00101] It may be understood that this embodiment of this application may be applicable to vendor privatization customization, and the vendor may determine, by using the first value state, that the PPDU carries the vendor specific information. In addition, this embodiment of this application may also be applied to a definition in a WLAN standard. It may be defined in the WLAN standard that the first value state may indicate some information. For example, it may be
20 defined in the WLAN standard that the first value state may indicate modulation schemes of N spatial streams in an unequal modulation scheme, where modulation schemes of at least two spatial streams in the N spatial streams are different.

[00102] In this embodiment of this application, one or more states of the any value state of the disregard bit, the non-default state of the validate bit, the disregard state, and the validate state are
25 used as an identifier of unequal modulation information or the vendor specific information, so that the device supporting the first transmission mechanism can read the PPDU whose first field is in the first value state, and obtain the unequal modulation information or the vendor specific information from the PPDU. In the foregoing manner, PPDU information defined in an original standard does not conflict with PPDU information defined during vendor privatization
30 customization or subsequent standard improvement.

[00103] For ease of understanding the solution, in this embodiment of this application, an

example in which the first value state indicates that the PPDU carries the vendor specific information is used for description. The following describes this application by using an example in which the vendor specific information is modulation schemes of the N spatial streams in the unequal modulation scheme, where N is an integer greater than 1, and the modulation schemes of the at least two spatial streams are different.

[00104] Optionally, the data field of the PPDU includes the N spatial streams, and the at least two spatial streams have different modulation schemes.

[00105] In a possible implementation, the first device may use a first value state to indicate that the PPDU carries the vendor specific information, and use at least one disregard bit in the PPDU to indicate a type of the vendor specific information. For example, if the vendor specific information is the unequal modulation scheme, the first device may indicate, by using at least one disregard bit in the PPDU, that the vendor specific information is the unequal modulation scheme.

[00106] After the second device receives the PPDU, if the second device supports the first transmission mechanism, the second device may determine, based on the first value state, that the PPDU carries the vendor specific information, and determine, by reading the at least one disregard bit in the PPDU, that the vendor specific information is the unequal modulation scheme. The second device reads the PPDU to obtain the modulation schemes of the N spatial streams.

[00107] The following describes seven possible examples of the first value state. It should be understood that the following seven examples are merely examples for description, and are not used as a specific limitation on the first value state.

[00108] Example 1: The first field may include a PPDU type and compression mode subfield and a non-orthogonal frequency division multiple access (orthogonal frequency division multiple access, OFDMA) transmission user quantity subfield. The first value state is that the PPDU type and the compression mode subfield indicate single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

[00109] In Example 1, that the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that the quantity of the users participating in non-OFDMA transmission is greater than 1 is used as the validate state or the disregard state.

[00110] For equal modulation-based single-user transmission, when the PPDU type and

compression mode subfield indicates single-user transmission, the non-OFDMA transmission user quantity subfield needs to indicate that the user quantity is 1, so that a receive end can read a unique user field, to obtain a modulation scheme in which a number of spatial streams and a number of all spatial streams are unified. In this embodiment of this application, when the PPDU type and compression mode subfield indicates single-user transmission, the quantity of non-OFDMA users may be indicated to be more than 1. That the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that the quantity of the users participating in non-OFDMA transmission is greater than 1 is used as the validate state or the disregard state. The PPDU type and the compression mode subfield indicates single-user transmission. A state in which the user quantity of non-OFDMA transmission is indicated to exceed 1 is considered as an identifier of the vendor specific information. A receive end that supports a transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may determine that the PPDU carries an identifier of the vendor specific information. A corresponding quantity of user fields appear subsequently based on indication of the user quantity of non-OFDMA. The vendor specific information is read from these user fields. A receive end that does not support the transmission mechanism "The first value state indicates that the PPDU carries the vendor specific information" may use, as the validate state or the disregard state, that the PPDU type and compression mode subfield indicates single-user transmission and a non-OFDMA transmission user quantity subfield indicates that the quantity of users participating in non-OFDMA transmission is greater than 1 for processing. For example, if the second device uses that the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA user quantity is indicated to exceed 1 as the validate state, the second device may wait until the PPDU ends, transfer information in a version independent field of the PPDU to a MAC layer, to ensure coexistence, and terminate receiving of the PPDU. Alternatively, if the second device uses that the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA user quantity is indicated to be greater than 1 as the disregard state, the second device may ignore a subfield in the disregard state, and continue to read another field. In this manner, vendor privatization customization can be implemented without changing the PPDU information defined in a WLAN standard.

[00111] Based on Example 1, the PPDU may indicate the modulation schemes of the N spatial streams by using a plurality of user fields. For example, the non-OFDMA transmission user

quantity subfield may indicate that a user quantity of is n , where n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, and the n user fields indicate the modulation schemes of the N spatial streams.

[00112] The n user fields may indicate the modulation schemes of the N spatial streams in any one of the following six manners.

[00113] Manner 1: A 1st user field in the n user fields indicates the quantity N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream, and 2nd to n^{th} user fields indicate modulation schemes of 2nd to N^{th} spatial streams.

[00114] For example, the 1st user field may use a signaling format that is of a user field used for non-MU-MIMO user transmission and that is defined in a WLAN standard. For example, the first user field may include a station identifier subfield, a spatial stream indication subfield, and an MCS indication subfield. The station identifier subfield may indicate an identifier of a target station. The spatial stream indication subfield may indicate the number N of the spatial streams. The MCS indication subfield may indicate the modulation scheme of the 1st spatial stream.

[00115] The 2nd to n^{th} user fields may not use the signaling format of the user field used for non-MU-MIMO user transmission and the signaling format of the user field used for MU-MIMO user transmission that are defined in the WLAN standard. The 2nd to n^{th} user fields may not have a fixed signaling format, and the modulation schemes of the 2nd to N^{th} spatial streams are indicated by combining bits of the second to the n^{th} user fields. In this manner, the 2nd to n^{th} user fields may also be combined into one field, and the field indicates the modulation schemes of the 2nd to N^{th} spatial streams.

[00116] For example, one user field includes 22 bits, and a modulation scheme of a spatial stream needs to be indicated by four bits. In this case, in addition to a spatial stream (that is, the first spatial stream) indicated by the 1st user field, a subsequent user field may additionally carry modulation scheme information of five spatial streams, and two user fields may additionally carry modulation scheme information of 11 spatial streams. Alternatively, the two user fields may be combined into one field to carry the modulation scheme information of the 11 spatial streams, and the three user fields may additionally carry modulation scheme information of 15 spatial streams. Similarly, the three user fields may be combined into one field to carry the modulation scheme information of 15 spatial streams.

[00117] For example, the PPDU may be shown in FIG. 4A.

[00118] Optionally, a manner of indicating the modulation scheme of the 1st spatial stream may be shown in Table 4.

Table 4

Value	Indicated modulation scheme
0	BPSK, R=1/2
1	QSPK, R=1/2
2	QPSK, R=3/4
3	16-QAM, R=1/2
4	16-QAM, R=3/4
5	64-QAM, R=2/3
6	64-QAM, R=3/4
7	64-QAM, R=5/6
8	256-QAM, R=3/4
9	256-QAM, R=5/6
10	1024-QAM, R=3/4
11	1024-QAM, R=5/6
12	4096-QAM, R=3/4
13	4096-QAM, R=5/6
14	BPSK, dual-carrier modulation, repetition, R=1/2
15	BPSK, dual-carrier modulation, R=1/2

5 **[00119]** According to the indication manner shown in Table 4, the modulation scheme of the 1st spatial stream needs to be indicated by at least four bits.

[00120] Optionally, modulation orders and/or bit rates of different spatial streams may be different. Therefore, the modulation schemes of the 2nd to Nth spatial streams need to indicate modulation orders and bit rates. A manner of indicating the modulation schemes of the 2nd to Nth spatial streams may be the same as a manner of indicating the modulation scheme of the first spatial stream. Therefore, a modulation scheme of one spatial stream in the 2nd to Nth spatial streams needs to be indicated by at least four bits. For example, a user field includes 22 bits, and

10

a modulation scheme of a spatial stream needs to be indicated by four bits. In addition to a spatial stream (that is, the 1st spatial stream) indicated by the 1st user field, a subsequent user field may additionally carry modulation scheme information of five spatial streams, two user fields may additionally carry modulation scheme information of 11 spatial streams, and three user fields may additionally carry modulation scheme information of 15 spatial streams.

[00121] Alternatively, code rates of the 2nd to Nth spatial streams may be the same as a code rate of the first spatial stream. Therefore, the modulation schemes of the 2nd to Nth spatial streams may indicate modulation orders. A manner of indicating the modulation schemes of the 2nd to Nth spatial streams may be shown in Table 5.

10

Table 5

Value	Indicated modulation scheme
0	BPSK
1	QPSK
2	16-QAM
3	64-QAM
4	256-QAM
5	1024-QAM
6	4096-QAM
7	Reserved

[00122] According to the indication manner shown in Table 5, a modulation scheme of any one of the 2nd to Nth spatial streams needs at least three bits for indication. For example, a user field includes 22 bits, and a modulation scheme of a spatial stream needs to be indicated by three bits.

15 In addition to a spatial stream (that is, 1st first spatial stream) indicated by the 1st user field, a subsequent user field may additionally carry modulation scheme information of seven spatial streams, two user fields may additionally carry modulation scheme information of 14 spatial streams, and three user fields may additionally carry modulation scheme information of 22 spatial streams.

20 **[00123]** According to the indication manner shown in Table 5, the second device may determine the modulation order and the bit rate of the 1st spatial stream by reading the 1st user field in the

PPDU, and determine the modulation orders of the 2nd to Nth spatial streams by reading the 2nd to nth user fields in the PPDU. Because the bit rates of the 2nd to Nth spatial streams may be the same as the bit rate of the 1st spatial stream, therefore, the second device may determine the bit rates of the 2nd to Nth spatial streams based on the bit rate of the 1st spatial stream.

5 **[00124]** In Manner 1, the first device may flexibly adjust, based on the quantity of the spatial streams and in the foregoing manner, the user quantity indicated by the non-OFDMA transmission user quantity subfield, to flexibly adjust a quantity of user fields, thereby reducing signaling overheads. For example, a user field includes 22 bits, and a modulation scheme of a spatial stream needs to be indicated by four bits. If there are three spatial streams, that is, N=3, and the non-OFDMA transmission user quantity subfield may indicate that the user quantity is 2, the PPDU
10 includes two user fields. A 1st user field may indicate a modulation scheme of a 1st spatial stream, and a 2nd user field may indicate modulation schemes of a 2nd spatial stream and a 3rd spatial stream. If there are nine spatial streams, that is, N=9, and the non-OFDMA transmission user quantity subfield may indicate that the quantity of users is 3, the PPDU includes three user fields. A 1st user
15 field may indicate a modulation scheme of a 1st spatial stream, and a 2nd user field may indicate modulation schemes of 2nd to 9th spatial streams.

[00125] Optionally, the first device may alternatively determine, based on a maximum quantity of spatial streams that can be implemented, the user quantity indicated by the non-OFDMA transmission user quantity subfield, to determine the quantity of user fields. For example, one user
20 field includes 22 bits, and a modulation scheme of one spatial stream needs to be indicated by 3 bits. If the maximum quantity of the spatial streams that can be implemented by the first device is 16, it may be determined that the non-OFDMA transmission user quantity subfield may indicate four users. In this case, the PPDU includes four user fields, the 1st user field may indicate the modulation scheme of the first spatial stream, and the 2nd user field to 4th user field may indicate
25 modulation schemes of remaining spatial streams. In this manner, a length of the PPDU is fixed, and processing at the receive end is easy to implement.

[00126] Alternatively, the PPDU may include a fixed quantity of user fields. When the number of the spatial streams exceeds a number of spatial streams that can be indicated by the fixed quantity of user fields, one or more spatial streams may be combined into one spatial stream group.
30 For example, it is assumed that the PPDU includes three user fields. For example, one user field includes 22 bits, and a modulation scheme of one spatial stream needs to be indicated by three bits.

The 1st user field may indicate one spatial stream, and the 2nd and the 3rd user fields may indicate 14 spatial streams in total. Therefore, the three user fields may indicate 15 spatial streams in total. When the total number N of the spatial streams ≤ 15 , 44 bits in the 2nd user field and the 3rd user field may respectively indicate modulation schemes of the second to the Nth spatial streams. When N=16, assuming that a modulation scheme of a 16th spatial stream is the same as a modulation scheme of a 15th spatial stream, the 15th spatial stream and the 16th spatial stream may be combined into one group. Alternatively, any two spatial streams may be combined into one group by using another combination method.

[00127] In addition to the bit used to indicate the modulation scheme of the spatial stream, there may be remaining bits in the user field of the PPDU. In an implementation, the remaining bits may be used to indicate the type of the vendor specific information. The remaining two bits are used as an example. It is assumed that 00 indicates that the vendor specific information is a modulation scheme for unequal modulation of each spatial stream, 01 indicates that the vendor specific information is HARQ-related indication, 10 indicates that the vendor specific information is AP coordination-related indication, and 11 is reserved. If the vendor specific information is a modulation scheme of unequal modulation of each spatial stream, the value of the remaining two bits may be 00. If the vendor specific information is the HARQ-related indication, the value of the remaining two bits may be 01. If the vendor specific information is the AP coordination-related indication, the value of the remaining two bits may be 10. It may be understood that, in this embodiment of this application, an example in which the vendor specific information is the modulation scheme for unequal modulation of each spatial stream is used for description. Therefore, the value of the remaining two bits may be 00, to indicate that the vendor specific information is the modulation scheme for unequal modulation of each spatial stream.

[00128] If this embodiment of this application is applied to a definition in a WLAN standard, the remaining bits and the non-OFDMA transmission user quantity subfield may indicate a plurality of functions. For example, the remaining two bits are used as an example. When the non-OFDMA transmission user quantity subfield indicates that the user quantity is greater than 1, the remaining bits may use 00 to indicate that the vendor specific information is a modulation scheme for unequal modulation of each spatial stream, 01 indicates that the vendor specific information is the HARQ-related indication, 10 indicates that the vendor specific information is the AP coordination-related indication, and 11 is reserved.

[00129] Manner 2: The 1st user field in the n user fields indicates the quantity of spatial streams, the identifier of the target station, and the modulation scheme of the 1st spatial stream. The 2nd to Nth spatial streams are divided into K spatial stream groups. 2nd to nth user fields indicate modulation schemes of the K spatial stream groups, where K is an integer, and $0 < K \leq N-1$.

5 **[00130]** For example, the PPDU may be shown in FIG. 4B.

[00131] In an implementation, a grouping manner of the K spatial stream groups may be fixed. A grouping manner corresponding to each value of the total number of spatial streams (number of spatial streams, NSS) is fixed, that is, a quantity of spatial stream groups and a number of spatial streams in each group that correspond to each value of the NSS are fixed. For example, when

10 NSS=2, the grouping manner is: grouping into two groups, where each spatial stream group includes one spatial stream. When NSS=3, the grouping manner is: grouping into three groups, where each spatial stream group includes one spatial stream. When NSS=4, the grouping manner is: grouping into four groups, where each spatial stream group includes one spatial stream. When

15 NSS=5, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 2, 1, 1, and 1. When NSS=6, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 2, 2, 1, and 1. When NSS=7, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 2, 2, 2, and 1. When NSS=8, the grouping manner is: grouping into four

20 groups, and numbers of spatial streams included in the four spatial stream groups are respectively 2, 2, 2, and 2. When NSS=9, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 3, 2, 2, and 2. When NSS=10, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 3, 3, 2, and 2. When NSS=11, the

25 grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 3, 3, 3, and 2. When NSS=12, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 3, 3, 3, and 3. For example, 1st to 3rd spatial streams are in one group, and 4th to 6th spatial streams are in one group. When NSS=13, the grouping manner is: grouping into

30 four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 4, 3, 3, and 3. When NSS=14, the grouping manner is: grouping into four groups, and

numbers of spatial streams included in the four spatial stream groups are respectively 4, 4, 3, and 3. When $NSS=15$, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 4, 4, 4, and 3. When $NSS=16$, the grouping manner is: grouping into four groups, and numbers of spatial streams included in the four spatial stream groups are respectively 4, 4, 4, and 4.

[00132] It should be understood that the foregoing grouping manner is merely an example for description. A specific quantity of groups into which spatial streams are grouped and a number of spatial streams in each group are not specifically limited herein.

[00133] It may be understood that when each spatial stream group includes one spatial stream, a quantity of spatial stream groups obtained through grouping is equal to a total number of spatial streams, that is, $K=N-1$. In this case, in Manner 2, the 2nd to Nth spatial streams are indicated by using the second to the nth user fields, and an implementation of Manner 2 may be the same as that of Manner 1.

[00134] In another implementation, the grouping manner of the K spatial stream groups may alternatively be determined by the first device and the second device through negotiation in advance. The first device and the second device may negotiate, in advance, grouping information corresponding to different total numbers of spatial streams. The grouping information includes at least one of the following information: the total number K of the spatial stream groups, and a number of spatial streams in each of the K spatial stream groups. For example, the first device and the second device may negotiate the grouping manner by using negotiation information of a signaling format shown in FIG. 5. The negotiation information may include an element identifier field used to indicate an element identifier, a length field used to indicate a length, a UEQM field used to indicate whether unequal (unequal) modulation (unequal modulation, UEQM) is supported, and may further include grouping information corresponding to a total number of spatial streams.

When $NSS=1$, the grouping information includes a number of spatial streams of each of M_1 spatial stream groups. It may be understood that when $NSS=1$, only one spatial stream group is included, the spatial stream group includes one spatial stream, and the negotiation information may not include grouping information when $NSS=1$. When $NSS=2$, the grouping information includes a number of spatial streams of each of M_2 spatial stream groups. Optionally, the negotiation information may not include grouping information when $NSS=2$. By analogy, when $NSS=R$, the grouping information includes a number of spatial streams in each of M_R spatial stream groups. R

may be a maximum number of spatial streams supported by the first device. Optionally, the negotiation information may be carried in an information element of a management frame, where the information element is a unit that carries information in the management frame.

[00135] Optionally, the first device and the second device may negotiate a manner of grouping spatial streams in an association process. For example, the AP adds corresponding negotiation information to a beacon frame to be sent, and the STA may add the corresponding negotiation information to an association request frame or a reassociation request frame. The AP may be the first device, and the STA may be the second device, or the AP is the second device, and the STA is the first device. Alternatively, the first device and the second device may negotiate the grouping information of the spatial stream by using a management frame in a data exchange process.

[00136] When the first device and the second device negotiate the grouping manner of the spatial streams, the first device may determine the grouping manner of the spatial streams and notify the second device of the grouping manner. Alternatively, the first device may send a request message to the second device, where the request message is used to request to negotiate grouping information of the spatial stream. The second device feeds back, to the first device, whether to accept the request message. If the second device does not receive the request message, the second device may send indication information to the first device, where the indication information indicates grouping information expected by the second device.

[00137] Manner 3: The N spatial streams are divided into H spatial stream groups. It may be understood that when $N=1$, H may be equal to a quantity M_1 of spatial stream groups corresponding to one spatial stream. When $N=2$, H may be equal to a quantity M_2 of spatial stream groups corresponding to two spatial streams. When $N=3$, H may be equal to a quantity M_3 of spatial stream groups corresponding to three spatial streams, and so on. When $N=R$, H may be equal to a group quantity M_R of spatial stream groups corresponding to R spatial streams. R may be a maximum number of spatial streams supported by the first device. One of the n user fields indicates a modulation scheme of one spatial stream group, and modulation schemes of spatial streams included in all spatial stream groups are the same.

[00138] In Manner 3, the user quantity n indicated by the non-OFDMA transmission user quantity subfield is equal to the quantity H of the spatial stream groups into which the N spatial streams are divided. In other words, the user quantity indicated by the non-OFDMA transmission user quantity subfield is H , and the PPDU indicates the modulation schemes of the H spatial stream

groups by using the H user fields.

[00139] In an implementation, the H user fields may use a signaling format that is of a user field used for MU-MIMO user transmission and that is defined in a WLAN standard. For example, the user field may include a station identifier subfield, a spatial stream allocation subfield, and an MCS indication subfield. The station identifier subfield indicates an identifier of a target station, the spatial stream allocation subfield indicates a number of spatial streams in each of the H spatial stream groups, and the MCS indication subfield indicates a modulation scheme of a spatial stream group.

[00140] A station identifier subfield in an i^{th} user field indicates an identifier of a target station, the spatial stream allocation subfield indicates a number of spatial streams in each of the H spatial stream groups, the MCS indication subfield indicates a modulation scheme of an i^{th} spatial stream group, and i is an integer greater than 0 and not greater than H.

[00141] For example, the PPDU may be shown in FIG. 6.

[00142] In another implementation, the H user fields may use a signaling format that is of a user field used for non-MU-MIMO user transmission and that is defined in a WLAN standard. For example, the user field may include a station identifier subfield, a spatial stream indication subfield, and an MCS indication subfield. The station identifier subfield indicates an identifier of a target station, the spatial stream indication subfield indicates a number of spatial streams of spatial stream groups, and the MCS indication subfield indicates a modulation scheme of a spatial stream group.

[00143] A station identifier subfield in an i^{th} user field indicates an identifier of a target station, the spatial stream allocation subfield indicates a number of spatial streams in each of an i^{th} spatial stream group, the MCS indication subfield indicates a modulation scheme of the i^{th} spatial stream group, and i is an integer greater than 0 and not greater than H.

[00144] For example, the PPDU may be shown in FIG. 7.

[00145] Optionally, for an indication manner of the modulation schemes of the H spatial stream groups, refer to related descriptions in Manner 1. Details are not described herein again.

[00146] In Manner 3, one user field indicates a modulation scheme of one spatial stream group. Therefore, the total quantity H of the spatial stream groups may be indicated by using the user quantity indicated by the non-OFDMA transmission user quantity subfield.

[00147] Manner 4: The N spatial streams are divided into H spatial stream groups. A first user field in n user fields may indicate grouping information of spatial streams, for example, a total

quantity H of spatial stream groups and a number of spatial streams in each of the H spatial stream groups. $n-1$ user fields other than the first user field in the n user fields may indicate modulation information of the H spatial stream groups. The first user field may be any one of the n user fields.

[00148] In an implementation, the first user field may be a user field including a station identifier subfield that is of a specific value. The user field including the station identifier subfield that is of the specific value may indicate grouping information of spatial streams, for example, the total quantity H of the spatial stream groups and the number of the spatial streams in each of the H spatial stream groups. For ease of description, the user field including the station identifier subfield that is of the specific value is referred to as a special user field below. $n-1$ user fields other than the special user field in the n user fields specifically indicate the modulation schemes of the H spatial stream groups.

[00149] For example, the special user field may include an NSS group quantity indication subfield and a spatial stream allocation subfield. The NSS group quantity indication subfield may indicate a total quantity H of spatial stream groups. The spatial stream allocation subfield may indicate the number of the spatial streams in each of the H spatial stream groups. The special user field may be shown in FIG. 8.

[00150] Optionally, a spatial stream allocation subfield in the special user field may be similar to a spatial stream allocation subfield in the 802.11be standard. The spatial stream allocation subfield in the 802.11be standard indicates a spatial stream allocation indication between users in MU-MIMO transmission. In the 802.11be standard, the spatial stream allocation subfield traverses the number of the spatial streams of each user in an index manner based on a quantity of non-OFDMA transmission users.

[00151] The spatial stream allocation subfield in the special user field may traverse the number of the spatial streams in each spatial stream group in the index manner based on the quantity of the spatial stream groups. For example, the quantity H of the spatial stream groups is 2 or 3, as shown in Table 6.

Table 6

Quantity of spatial streams	6 bits indication	Number of spatial streams in group 1	Number of spatial streams in group 2	Number of spatial streams in group 3	Number of spatial streams in group 4	Number of spatial streams in group 5	Number of spatial streams in group 6	Number of spatial streams in group 7	Number of spatial streams in group 8	Total number of spatial streams
2	000000-000011	1-4	1							2-5
	000100-000110	2-4	2							4-6
	000111-001000	3-4	3							6-7
	001001	4	4							8
3	000000-000011	1-4	1	1						3-6
	000100-000110	2-4	2	1						5-7
	000111-001000	3-4	3	1						7-8
	001001	4	4	1						9
	001010-001100	2-4	2	2						6-8
	001101-001110	3-4	3	2						8-9
	001111	4	4	2						10
	010000-010001	3-4	3	3						9-10
	010010	4	4	3						11
	010011	4	4	4						12

[00152] Optionally, that the $n-1$ user fields indicate the modulation schemes of the H spatial stream groups may be similar to a manner in which the 2^{nd} to n^{th} user fields indicate the 2^{nd} to N^{th}

spatial streams in Manner 1. A difference lies in that in Manner 1, one spatial stream is used as a unit for indication, and in Manner 3, one spatial stream group is used as a unit for indication. For details that the $n-1$ user fields indicate the modulation schemes of the H spatial stream groups, refer to related descriptions in Manner 1. Details are not described herein again. For example, the PPDU may be shown in FIG. 9.

[00153] Alternatively, the modulation scheme in which the $n-1$ user fields indicate the H spatial stream groups may be similar to a manner in which the 2nd to n^{th} user fields indicate the K spatial stream groups in Manner 2. For details, refer to related descriptions in Manner 2. Details are not described herein again. For example, the PPDU may be shown in FIG. 10.

[00154] Alternatively, the modulation scheme in which the $n-1$ user fields indicate the H spatial stream groups may be similar to the manner in which the H user fields indicate the H spatial stream groups in Manner 3. For details, refer to related descriptions in the foregoing manner 3. Details are not described herein again. For example, the PPDU may be shown in FIG. 11.

[00155] Manner 5: The N spatial streams are divided into H spatial stream groups. A 1st user field in the n user fields indicates a total quantity H of spatial stream groups, an identifier of a target station, and a modulation scheme of a 1st spatial stream group. 2nd to n^{th} user fields indicate modulation schemes of 2nd to H^{th} spatial stream groups.

[00156] Optionally, that the n user fields indicate the modulation schemes of the H spatial stream groups may be similar to a manner in which the n user fields indicate the N spatial streams in Manner 1. A difference lies in that in Manner 1, one spatial stream is used as a unit for indication, and in Manner 5, one spatial stream group is used as a unit for indication. For details that the n user fields indicate the modulation schemes of the H spatial stream groups, refer to related descriptions in Manner 1. Details are not described herein again.

[00157] Manner 6: One user field in the n user fields indicates a modulation scheme of one spatial stream. In this manner, the quantity n of user fields may be equal to the quantity N of spatial streams. The PPDU includes N user fields. A j^{th} user field in the N user fields indicates a modulation scheme of a j^{th} spatial stream of the N spatial streams, j is an integer, and $1 \leq j \leq N$.

[00158] Optionally, that the n user fields indicate the modulation schemes of the N spatial streams may be similar to a manner in which the n user fields indicate the H spatial stream groups in Manner 3. A difference lies in that in Manner 3, one spatial stream group is used as a unit for indication, and in Manner 6, one spatial stream is used as a unit for indication. For details that the

modulation schemes of the N spatial streams indicated by the n user fields, refer to related descriptions in Manner 3. Details are not described herein again.

[00159] Example 2: The first field may also include a PPDU type and compression mode subfield, a non-OFDMA transmission user quantity subfield, and a user field. The first value state is that the PPDU type and the compression mode subfield indicate single-user transmission. The non-OFDMA transmission user quantity subfield indicates that the quantity of users participating in non-OFDMA transmission is greater than 1, and there is a user field whose station identifier subfield is of a specific value (that is, there is a special user field).

[00160] In Example 2, that the PPDU type and compression mode subfield indicates single-user transmission, the non-OFDMA transmission user quantity subfield indicates that the quantity of the users participating in non-OFDMA transmission is greater than 1, and there is a user field whose station identifier subfield is of a specific value is used as the validate state or the disregard state.

[00161] Example 3: The first field may alternatively include a non-OFDMA transmission user quantity subfield and a user field. The first value state is that the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1, and there is a user field whose station identifier subfield is of a specific value (that is, there is a special user field).

[00162] In Example 3, that the non-OFDMA transmission user quantity subfield indicates that the quantity of the users participating in non-OFDMA transmission is greater than 1, and there is a user field whose station identifier subfield is of a specific value is used as the validate state or the disregard state.

[00163] Example 4: The first field may also include a PPDU type and compression mode subfield and a user field. The first value state is that the PPDU type and the compression mode subfield indicate single-user transmission, and there is a user field whose station identifier subfield is of a specific value (that is, there is a special user field).

[00164] In Example 4, that the PPDU type and compression mode subfield indicates single-user transmission, and there is a user field whose station identifier subfield is of a specific value is used as the validate state or the disregard state.

[00165] Example 5: Alternatively, the first field may include only a user field. The first value state is that there is a user field whose station identifier subfield is of a specific value (that is, there

is a special user field).

[00166] In Example 5, that there is a user field whose station identifier subfield is of a specific value is used as the validate state or the disregard state.

[00167] Optionally, in Example 3 to Example 5, for a manner of indicating the modulation schemes of the N spatial streams, refer to a manner in which the special user field indicates the total quantity H of the spatial stream groups and the number of spatial streams in each of the H spatial stream groups in Manner 4. n-1 user fields in the n user fields except the special user field specifically indicate the modulation schemes of the H spatial stream groups. Details are not described herein again.

[00168] Example 6: The first value state may also be a validate state defined in a WLAN standard. For example, the first value state may be one or more validate states defined in the 802.11be standard.

[00169] For example, the first value state may be that the value of an uplink/downlink subfield is 0 (or the uplink/downlink subfield indicates downlink), and the value of the PPDU type and compression mode subfield is 3. Alternatively, the first value state may also be that the value of the uplink/downlink subfield is 1 (or the uplink/downlink subfield indicates uplink), and the value of the PPDU type and compression mode subfield is 3.

[00170] For example, the first value state may be shown in Table 7.

Table 7

U-SIG field		Description				
Uplink/Downlink	EHT PPDU type and compression mode	EHT PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
0 (downlink)	0	EHT MU	Yes	Yes	≥ 1	DL OFDMA, including non-MU-MIMO

U-SIG field		Description				
Uplink/Downlink	EHT PPDU type and compression mode	EHT PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
						and MU-MIMO
	1	EHT MU	Yes	No	1	SU or NDP (not sent to an AP, usually refers to downlink)
	2	EHT MU	Yes	No	> 1	DL MU-MIMO (non-OFDMA transmission)
	3	-	-	-	-	First value state
1 (uplink)	0	EHT TB (based on triggering)	No	-	≥ 1	UL OFDMA (including non-MU-MIMO and MU-MIMO)
	1	EHT MU	Yes	No	1	SU or NDP (sent to an AP, that is, uplink)
	2	-	-	-	-	Validate
	3					First value state

[00171] Example 7: the first value state may also be indicated by using a validate state defined in a WLAN standard and a validate bit defined in the WLAN standard. For example, the first value state may be indicated by using a validate state and a validate bit defined in the 802.11be standard.

[00172] For example, the first value state may be that the value of the uplink/downlink subfield is 0 (or the uplink/downlink subfield indicates downlink), the value of the PPDU type and compression mode subfield is 3, and one validate bit of the U-SIG field is 0. Alternatively, the first value state may also be that the value of the uplink/downlink subfield is 1 (or the uplink/downlink subfield indicates uplink), the value of the PPDU type and compression mode subfield is 3, and one validate bit of the U-SIG field is 0.

[00173] For example, the first value state may be shown in Table 8.

Table 8

U-SIG field			Description				
Uplink/Downlink	PPDU type and compression mode	Validate bit (extended bit)	EHT PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
0 (downlink)	0	1 (default value)	EHT MU	Yes	Yes	≥ 1	DL OFDMA, including non-MU-MIMO and MU-MIMO
	1	1 (default value)	EHT MU	Yes	No	1	SU or NDP (not sent to an AP, usually refers to downlink)
	2	1 (default value)	EHT MU	Yes	No	> 1	DL MU-MIMO (non-

U-SIG field			Description				
Uplink/Downlink	PPDU type and compression mode	Validate bit (extended bit)	EHT PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
							OFDMA transmission)
	3	1 (default value)	-	-	-	-	Validate
	0-2	0 (non-default value)	-	-	-	-	Validate
	3	0 (non-default value)	-	-	-	-	First value state
1 (uplink)	0	1 (default value)	EHT TB (trigger based, based on triggering)	No	-	≥ 1	UL OFDMA (including non-MU-MIMO and MU-MIMO)
	1	1 (default value)	EHT MU	Yes	No	1	SU or NDP (sent to an AP, that is, uplink)
	2	1 (default value)	-	-	-	-	Validate
	0-2	0 (non-default value)					Validate
	3	0 (non-					First value

U-SIG field			Description				
Uplink/Downlink	PPDU type and compression mode	Validate bit (extended bit)	EHT PPDU type	Whether EHT-SIG exists?	Whether a resource unit allocation indication subfield exists?	Quantity of users in a PPDU	Note
		default value)					state

[00174] Optionally, in Example 6 and Example 7, for a manner of indicating the modulation schemes of the N spatial streams, refer to the manner of indicating the modulation schemes of the N spatial streams in Example 1. Details are not described herein again.

5 **[00175]** In a possible implementation, after receiving the PPDU, the second device may check and code the 1st user field in the PPDU together with a common part, and a subsequent user field may be checked and coded by using two user fields as a group. If the last group includes one user field, the user field may be checked and coded independently.

10 **[00176]** In this embodiment of this application, one or more of the disregard state, the validate state, any state of the disregard bit, and the non-default state of the validate bit are defined as the identifier of the vendor specific information, so that the device supporting the first transmission mechanism can read the corresponding vendor specific information based on the first value state. For a device that does not support the first transmission mechanism, the state is considered as the disregard state or the validate state, so that interworking between devices is not affected.

15 **[00177]** Any one of the validate state, the disregard state, the non-default state of the validate bit, and the disregard bit other than the first value state is not used by each vendor, and therefore may be used for subsequent standard extension to support more extended features. In addition, the validate state does not conflict with a vendor specific feature, and does not cause an interoperability problem.

20 **[00178]** In addition, the WLAN standard starts from 802.11a/b/g and goes through 802.11n, 802.11ac, to 802.11ax. 802.1a/b/g supports only a single spatial stream and does not support MIMO. 802.11n supports MIMO of a maximum of four spatial streams. Each spatial stream can

use a different MCS to adapt to a signal-to-noise ratio (signal-to-noise ratio, SNR) of a different spatial stream. This mode is called UEQM. Based on a number of spatial streams, each case may be traversed in an index manner. For example, the MCS field may include 7 bits, and 20 MHz or 40 MHz is indicated based on the CBW. The MCS field may be shown in Table 9.

5

Table 9

MCS field indication	Meaning
0	BPSK, R=1/2, 1 spatial stream (spatial stream, SS)
1	QPSK, R=1/2, 1SS
2	QPSK, R=3/4, 1SS
3	16-QAM, R=1/2, 1SS
4	16-QAM, R=3/4, 1SS
5	64-QAM, R=2/3, 1SS
6	64-QAM, R=3/4, 1SS
7	64-QAM, R=5/6, 1SS
8-15	Modulation corresponds to MCS 0-7, 2SS, equal modulation
16-23	Modulation corresponds to MCS 0-7, 3SS, equal modulation
24-31	Modulation corresponds to MCS 0-7, 4SS, equal modulation
32	When a bandwidth is 20 MHz, reserved When a bandwidth is 40 MHz, indicate a replicated 20 MHz mode
33-38	2SS, unequal modulation
39-52	3SS, unequal modulation
53-76	4SS, unequal modulation

[00179] In an implementation, the MCS may indicate both a modulation and coding scheme and a number of spatial streams. In the unequal modulation scheme, using 20 MHz and two spatial streams as an example, a manner in which the MCS indicates the modulation and coding scheme and the number of the spatial streams may be shown in Table 10.

10

Table 10

MCS field indication	Modulation		R
	Spatial stream 1	Spatial stream 2	
33	16-QAM	QPSK	1/2
34	64-QAM	QPSK	1/2
35	64-QAM	16-QAM	1/2
36	16-QAM	QPSK	3/4
37	64-QAM	QPSK	3/4
38	64-QAM	16-QAM	3/4

[00180] In the unequal modulation scheme, using 20 MHz and two spatial streams as an example, a manner in which the MCS indicates the modulation and coding scheme and the number of the spatial streams may be shown in Table 11.

Table 11

MCS field indication	Modulation			R
	Spatial stream 1	Spatial stream 2	Spatial stream 3	
39	16-QAM	QPSK	QPSK	1/2
40	64-QAM	16-QAM	QPSK	1/2
41	64-QAM	QPSK	QPSK	1/2
42	16-QAM	16-QAM	QPSK	1/2
43	64-QAM	16-QAM	16-QAM	1/2
44	64-QAM	64-QAM	QPSK	1/2
45	64-QAM	64-QAM	16-QAM	1/2
46	16-QAM	QPSK	QPSK	3/4
47	16-QAM	16-QAM	QPSK	3/4
48	64-QAM	QPSK	QPSK	3/4
49	64-QAM	64-QAM	QPSK	3/4
50	64-QAM	16-QAM	16-QAM	3/4

MCS field indication	Modulation			R
	Spatial stream 1	Spatial stream 2	Spatial stream 3	
51	64-QAM	64-QAM	QPSK	3/4
52	64-QAM	64-QAM	16-QAM	3/4

[00181] For MCS 53-76, refer to related descriptions in the WLAN standard 802.11n. Details are not described herein again.

[00182] However, as a quantity of supported spatial streams increases and more MCS types are supported, entries in the table increase exponentially, and a large amount of storage and computing power needs to be consumed. It is obviously unrealistic to traverse each case in an index manner.

[00183] In this embodiment of this application, a user field is used to indicate a modulation scheme of each spatial stream (or each spatial stream group), and a quantity of user fields may be adjusted based on a number of spatial streams (or spatial stream groups), so that modulation schemes of a plurality of spatial streams can be indicated in a scenario of a plurality of spatial streams. Compared with a manner of traversing each case in an index manner, an implementation of this embodiment of this application is relatively simple. In addition, it is designed that some user fields may not include a station identifier subfield, a spatial stream indication subfield, or the like, so that the user field can use more bits to indicate a modulation scheme of a spatial stream.

Compared with that the user field uses a fixed signaling format, each user field needs to indicate redundant information such as an identifier of a target station and spatial stream information. In this embodiment of this application, bit utilization can be improved, so that signaling overheads can be reduced, and a throughput rate gain can be improved.

[00184] Based on a same technical concept as the method embodiments, an embodiment of this application provides an information indication apparatus. A structure of the apparatus may be shown in FIG. 12, including a processing unit 1201 and a transceiver unit 1202.

[00185] In an implementation, the information indication apparatus may be specifically configured to implement the methods performed by the first device in the embodiments in FIG. 2 to FIG. 3, FIG. 4A, FIG. 4B, and FIG. 5 to FIG. 11. The apparatus may be the first device, or may be a chip, a chipset, or a part of a chip in the first device that is configured to perform a related method function. The first device may be an AP, or may be a STA. The processing unit 1201 is configured to generate a physical layer protocol data unit PPDU, where a first field in a signaling

field of the PPDU is in a first value state, the first value state indicates that the PPDU carries vendor specific information, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state. The transceiver unit 1202 is configured to send the PPDU.

5 **[00186]** For example, the first field includes a PPDU type and compression mode subfield and a non-OFDMA transmission user quantity subfield. The first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

10 **[00187]** In a possible design, the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different.

[00188] For example, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a 1st
15 user field in the n user fields indicates the total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of 2nd to Nth spatial streams.

[00189] For example, a station identifier subfield in the 1st user field indicates the identifier of the target station. A spatial stream indication subfield in the 1st user field indicates the total number
20 N of the spatial streams. A modulation and coding scheme MCS indication subfield in the 1st user field indicates the modulation scheme of the 1st spatial stream.

[00190] For example, the first field includes a user field. The first value state is indicated by using the following validate state or disregard state. The second validate state is that a value of a station identifier subfield in the user field is a specific value.

25 **[00191]** Optionally, the vendor specific information is modulation schemes for N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two spatial streams are different.

[00192] For example, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is m, and m is an integer greater than 1. The N spatial streams are divided into H
30 spatial stream groups, where H is an integer greater than 1. The PPDU includes m user fields. A first user field in the m user fields indicates the total quantity H of the spatial stream groups and a

number of spatial streams in each of the H spatial stream groups. m-1 user fields in the m user fields other than the first user field indicate a modulation scheme of each of the H spatial stream groups.

[00193] Optionally, the first user field is a user field whose station identifier subfield has a specific value.

[00194] In another implementation, the information indication apparatus may be specifically configured to implement the method performed by the second device in the embodiments. The apparatus may be the second device, or may be a chip, a chipset, or a part of a chip in the second device that is configured to perform a related method function. The second device may be an AP, or may be a STA. The transceiver unit 1202 is configured to receive a physical layer protocol data unit PPDU, where a first field in a signaling field of the PPDU is in a first value state, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state. The processing unit 1201 is configured to: if a first transmission mechanism is supported, obtain vendor specific information from the PPDU, where the first transmission mechanism is that the first value state indicates that the PPDU carries the vendor specific information; or if a first transmission mechanism is not supported, process the PPDU by using the first value state as the validate state or the disregard.

[00195] For example, the first field includes a PPDU type and compression mode subfield and a non-OFDMA transmission user quantity subfield. The first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

[00196] In a possible design, the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different.

[00197] For example, the non-OFDMA transmission user quantity subfield indicates that a quantity of users is n, n is an integer, and $1 < n \leq N$. The PPDU includes n user fields, where a 1st user field in the n user fields indicates the total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream. 2nd to nth user fields indicate modulation schemes of 2nd to Nth spatial streams.

[00198] For example, a station identifier subfield in the 1st user field indicates the identifier of the target station. A spatial stream indication subfield in the 1st user field indicates the total number N of the spatial streams. A modulation and coding scheme MCS indication subfield in the 1st user field indicates the modulation scheme of the 1st spatial stream.

5 **[00199]** For example, the first field includes a user field. The first value state is indicated by using the following validate state or disregard state. The second validate state is that a value of a station identifier subfield in the user field is a specific value.

[00200] Optionally, the vendor specific information is modulation schemes for N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes
10 of at least two spatial streams are different.

[00201] For example, the non-OFDMA transmission user quantity subfield indicates that the quantity of users is m, and m is an integer greater than 1. The N spatial streams are divided into H spatial stream groups, where H is an integer greater than 1. The PPDU includes m user fields. A first user field in the m user fields indicates the total quantity H of the spatial stream groups and a
15 number of spatial streams in each of the H spatial stream groups. m-1 user fields in the m user fields other than the first user field indicate a modulation scheme of each of the H spatial stream groups.

[00202] Optionally, the first user field is a user field whose station identifier subfield has a specific value.

20 **[00203]** Division into the modules in embodiments of this application is an example, is merely division into logical functions, and may be other division during actual implementation. In addition, functional modules in embodiments of this application may be integrated into one processor, or each of the modules may exist alone physically, or two or more modules may be integrated into one module. The integrated module may be implemented in a form of hardware, or may be
25 implemented in a form of a software functional module. It may be understood that for functions or implementations of the modules in embodiments of this application, further refer to related descriptions in the method embodiments.

[00204] In a possible manner, the information indication apparatus may be shown in FIG. 13. The apparatus may be a communication device or a chip in a communication device. The
30 communication device may be the first device, or may be the second device. The first device may be an AP or a STA, and the second device may be an AP or a STA. The apparatus may include a

processor 1301, a communication interface 1302, and a memory 1303. The processing unit 1201 may be the processor 1301. The transceiver unit 1202 may be the communication interface 1302.

[00205] The processor 1301 may be a central processing unit (central processing unit, CPU), a digital processing unit, or the like. The communication interface 1302 may be a transceiver, an interface circuit such as a transceiver circuit, a transceiver chip, or the like. The apparatus further includes a memory 1303, configured to store a program executed by the processor 1301. The memory 1303 may be a nonvolatile memory such as a hard disk drive (hard disk drive, HDD) or a solid-state drive (solid-state drive, SSD), or may be a volatile memory (volatile memory) such as a random access memory (random access memory, RAM). The memory 1303 is any other medium capable of carrying or storing expected program code in a form of instructions or data structures and capable of being accessed by a computer, but is not limited thereto.

[00206] The processor 1301 is configured to execute the program code stored in the memory 1303, and is specifically configured to perform an action of the processing unit 1201. Details are not described herein again in this application. The communication interface 1302 is specifically configured to perform an action of the transceiver unit 1202. Details are not described in this application again.

[00207] A specific connection medium between the communication interface 1302, the processor 1301, and the memory 1303 is not limited in this embodiment of this application. In this embodiment of this application, the memory 1303, the processor 1301, and the communication interface 1302 are connected to each other through a bus 1304 in FIG. 13. The bus is represented by using a bold line in FIG. 13. A connection manner between other components is merely an example for description, and is not limited thereto. The bus may be classified into an address bus, a data bus, a control bus, and the like. For ease of representation, only one bold line is used to represent the bus in FIG. 13, but this does not mean that there is only one bus or only one type of bus.

[00208] An embodiment of the present invention further provides a computer-readable storage medium, configured to store computer software instructions that need to be executed by the foregoing processor, and the computer-readable storage medium includes a program that needs to be executed by the foregoing processor.

[00209] All or some of the foregoing embodiments may be implemented by using software, hardware, firmware, or any combination thereof. When software is used to implement the

embodiments, all or a part of the embodiments may be implemented in a form of a computer program product. The computer program product includes one or more computer instructions. When the computer program instructions are loaded and executed on the computer, the procedure or functions according to embodiments of this application are all or partially generated. The computer may be a general-purpose computer, a dedicated computer, a computer network, or other programmable apparatuses. 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, server, or data center to another website, computer, server, or data center in a wired (for example, a coaxial cable, an optical fiber, or a digital subscriber line (DSL)) or wireless (for example, infrared, radio, or microwave) 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), or a semiconductor medium (for example, an SSD).

[00210] This application is described with reference to the flowcharts and/or block diagrams of the method, the device (system), and the computer program product according to this application. It should be understood that computer program instructions may be used to implement each process and/or each block in the flowcharts and/or the block diagrams and a combination of a process and/or a block in the flowcharts and/or the block diagrams. These computer program instructions may be provided for a general-purpose computer, a dedicated computer, an embedded processor, or a processor of any other programmable data processing device to generate a machine, so that the instructions executed by a computer or a processor of any other programmable data processing device generate an apparatus for implementing a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[00211] These computer program instructions may be stored in a computer-readable memory that can instruct the computer or any other programmable data processing device to work in a specific manner, so that the instructions stored in the computer-readable memory generate an artifact that includes an instruction apparatus. The instruction apparatus implements a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[00212] The computer program instructions may alternatively be loaded onto a computer or another programmable data processing device, so that a series of operations and steps are performed on the computer or the another programmable device, so that computer-implemented processing is generated. Therefore, the instructions executed on the computer or the another programmable device provide steps for implementing a specific function in one or more procedures in the flowcharts and/or in one or more blocks in the block diagrams.

[00213] It is clearly that a person skilled in the art can make various modifications and variations to this application without departing from the spirit and scope of this application. This application is intended to cover these modifications and variations of this application provided that they fall within the scope of protection defined by the following claims and their equivalent technologies.

CLAIMS

What is claimed is:

1. An information indication method, comprising:

generating, by a first device, a physical layer protocol data unit PPDU, wherein a first field
5 in a signaling field of the PPDU is in a first value state, the first value state indicates that the PPDU carries vendor specific information, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state; and

sending, by the first device, the PPDU.

10 2. An information indication method, comprising:

receiving, by a second device, a physical layer protocol data unit PPDU, wherein a first field
in a signaling field of the PPDU is in a first value state, and the first value state is indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state; and

15 if the second device supports a first transmission mechanism, obtaining, by the second device, vendor specific information from the PPDU, wherein the first transmission mechanism is that the first value state indicates that the PPDU carries the vendor specific information; or

if the second device does not support a first transmission mechanism, processing, by the second device, the PPDU by using the first value state as the validate state or the disregard state.

20 3. The method according to claim 1 or 2, wherein the first field comprises a PPDU type and compression mode subfield and a non-orthogonal frequency division multiple access OFDMA transmission user quantity subfield; and

the first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-
25 OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

4. The method according to claim 3, wherein the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different.

30 5. The method according to claim 4, wherein the non-OFDMA transmission user quantity

subfield indicates that the quantity of users is n , n is an integer, and $1 < n \leq N$; and

the PPDU comprises n user fields, wherein a 1st user field in the n user fields indicates a total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream, and 2nd to n^{th} user fields indicate modulation schemes of 2nd to N^{th} spatial streams.

5 6. The method according to claim 5, wherein a station identifier subfield in the 1st user field indicates the identifier of the target station, a spatial stream indication subfield in the 1st user field indicates the total number N of the spatial streams, and a modulation and coding scheme MCS indication subfield in the 1st user field indicates the modulation scheme of the 1st spatial stream.

7. The method according to claim 1 or 2, wherein the first field comprises a user field; and
10 the first value state is indicated by using the following validate state or disregard state: a value of a station identifier subfield of the user field is a specific value.

8. The method according to claim 7, wherein the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two spatial streams are different.

15 9. The method according to claim 4 or 8, wherein the non-OFDMA transmission user quantity subfield indicates that the quantity of users is m , and m is an integer greater than 1; and

the N spatial streams are divided into H spatial stream groups, wherein H is an integer greater than 1, the PPDU comprises m user fields, a 1st user field in the m user fields indicates a total quantity H of the spatial stream groups and a number of spatial streams in each of the H spatial
20 stream groups, $m-1$ user fields in the m user fields other than the 1st user field indicate a modulation scheme of each of the H spatial stream groups.

10. An information indication apparatus, comprising:

a processing unit, configured to generate a physical layer protocol data unit PPDU, wherein
a first field in a signaling field of the PPDU is in a first value state, the first value state indicates
25 that the PPDU carries vendor specific information, and the first value state is indicated by using
one or more of the following states: any value state of a disregard bit, a non-default state of a
validate bit, a disregard state, and a validate state; and

a transceiver unit, configured to send the PPDU.

11. An information indication apparatus, comprising:

30 a transceiver unit, configured to receive a physical layer protocol data unit PPDU, wherein a
first field in a signaling field of the PPDU is in a first value state, and the first value state is

indicated by using one or more of the following states: any value state of a disregard bit, a non-default state of a validate bit, a disregard state, and a validate state; and

a processing unit, configured to: if a first transmission mechanism is supported, obtain vendor specific information from the PPDU, wherein the first transmission mechanism is that the first value state indicates that the PPDU carries the vendor specific information; or

if a first transmission mechanism is not supported, process the PPDU by using the first value state as the validate state or the disregard state.

12. The apparatus according to claim 10 or 11, wherein the first field comprises a PPDU type and compression mode subfield and a non-orthogonal frequency division multiple access OFDMA transmission user quantity subfield; and

the first value state is indicated by using the following validate state or disregard state: the PPDU type and compression mode subfield indicates single-user transmission, and the non-OFDMA transmission user quantity subfield indicates that a quantity of users participating in non-OFDMA transmission is greater than 1.

13. The apparatus according to claim 12, wherein the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two of the N spatial streams are different.

14. The apparatus according to claim 13, wherein the non-OFDMA transmission user quantity subfield indicates that the quantity of users is n, n is an integer, and $1 < n \leq N$; and

the PPDU comprises n user fields, wherein a 1st user field in the n user fields indicates a total number N of the spatial streams, an identifier of a target station, and a modulation scheme of a 1st spatial stream, and 2nd to nth user fields indicate modulation schemes of 2nd to Nth spatial streams.

15. The apparatus according to claim 14, wherein a station identifier subfield in the 1st user field indicates the identifier of the target station, a spatial stream indication subfield in the 1st user field indicates the total number N of the spatial streams, and a modulation and coding scheme MCS indication subfield in the 1st user field indicates the modulation scheme of the 1st spatial stream.

16. The apparatus according to claim 10 or 11, wherein the first field comprises a user field; and

the first value state is indicated by using the following validate state or disregard state: a value of a station identifier subfield of the user field is a specific value.

17. The apparatus according to claim 16, wherein the vendor specific information is modulation schemes of N spatial streams in an unequal modulation scheme, N is an integer greater than 1, and modulation schemes of at least two spatial streams are different.

18. The apparatus according to claim 13 or 17, wherein the non-OFDMA transmission user
5 quantity subfield indicates that the quantity of users is m, and m is an integer greater than 1; and
the N spatial streams are divided into H spatial stream groups, wherein H is an integer greater than 1, the PPDU comprises m user fields, a 1st user field in the m user fields indicates a total quantity H of the spatial stream groups and a number of spatial streams in each of the H spatial stream groups, m-1 user fields in the m user fields other than the 1st user field indicate a modulation
10 scheme of each of the H spatial stream groups.

19. A computer-readable storage medium, wherein the computer-readable storage medium stores a program or instructions, and when the program or the instructions is/are read and executed by one or more processors, the method according to any one of claims 1 to 9 is implemented.

20. A computer program product, wherein when the computer program product runs on a
15 communication device, the communication device is enabled to perform the method according to any one of claims 1 to 9.

21. A communication apparatus, wherein the apparatus comprises a processor and a communication interface, the communication interface is configured to receive computer program code or instructions and transmit the computer program code or the instructions to the processor,
20 the processor runs the computer program code or the instructions to enable the apparatus to implement the method according to claim 1 or any one of claims 3 to 9, or the processor runs the computer program code or the instructions to enable the apparatus to implement the method according to any one of claims 2 to 9.