COMMUNICATION METHOD AND APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202410370341.1, filed with the China National Intellectual Property Administration on March 26, 2024 and entitled "COMMUNICATION 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 a communication method and apparatus.

BACKGROUND

[0003] Data traffic is rapidly increasing with the development of mobile internet and popularization of smart terminals. A wireless local area network (wireless local area network, WLAN) features a high rate and low costs, and therefore has become one of the mainstream mobile broadband access technologies.

[0004] A transmit opportunity (transmit opportunity, TXOP) is introduced in the wireless local area network, to ensure data transmission reliability between devices. A TXOP holder may continuously perform data transmission in the TXOP, without being interrupted by another device. For example, when the TXOP holder is a station (station, STA) 1, the STA 1 may continuously send uplink data to an associated access point (access point, AP) in the TXOP, while another STA associated with the AP cannot send uplink data to the AP in the TXOP. For another example, when the TXOP holder is an AP, the AP may continuously send downlink data to an associated STA in the TXOP, while the STA associated with the AP cannot send uplink data to the AP in the TXOP.

[0005] To further improve transmission efficiency and increase a network throughput, a TXOP sharing (TXOP sharing, TXS) mechanism is introduced into the wireless local area network. In the TXS mechanism, when the TXOP holder is the AP, the AP may use a part of time in the TXOP as TXS time, and schedule, within the TXS time, the associated STA to perform uplink transmission. However, in related technologies, only an AP can determine TXS time in a TXOP and share the TXS time with an associated STA when the TXOP holder is the AP, and there is currently no

solution for sharing a part of time in the TXOP of an STA with another STA for uplink transmission when the TXOP holder is the STA.

SUMMARY

[0006] This application provides a communication method and apparatus, to provide a solution for sharing time in a TXOP of an STA with another STA for uplink transmission.

[0007] According to a first aspect, an embodiment of this application provides a communication method. The method may be applied to an access point device side, for example, an access point device, a communication module in an access point device, or a circuit, a chip, or a chip system responsible for a communication function in an access point device. For example, the method is applied to the access point device. In the method, when a TXOP holder is a first terminal device, the access point device receives first indication information, where the first indication information indicates that a second terminal device has to-be-transmitted first uplink data; and the access point device sends second indication information to the second terminal device, where the second indication information indicates the second terminal device to send the first uplink data within first TXS time, and the first TXS time is a resource in the TXOP.

[0008] According to the foregoing method, when the TXOP holder is the first terminal device, when determining that the second terminal device has to-be-transmitted uplink data, the access point device may schedule the second terminal device to perform uplink transmission within the first TXS time in the TXOP. In this way, after the second terminal device generates to-be-transmitted uplink data, long waiting time can be avoided, and data transmission reliability of the second terminal device can be improved. For example, when the first uplink data to be transmitted by the second terminal device is low latency traffic LLT data, waiting time of the second terminal device can be reduced, and traffic transmission reliability of the second terminal device can be improved.

[0009] In a possible design, the access point device sends a first request message to the first terminal device, where the first request message is used to request the first TXS time in the TXOP.

[0010] According to the foregoing design, when the TXOP holder is the first terminal device, the access point device may request the first TXS time in the TXOP from the first terminal device, so that the first terminal device can determine an occasion for sharing the TXOP.

[0011] In a possible design, the access point device receives, in a first frequency domain resource, the first indication information sent by the second terminal device, where the first frequency domain resource is a part of frequency domain resources within a transmission bandwidth of the first terminal device, or the first frequency domain resource is a frequency

domain resource outside the transmission bandwidth of the first terminal device.

[0012] Optionally, the first frequency domain resource includes a plurality of tone sets corresponding to the second terminal device, and the plurality of tone sets include a first tone set and a second tone set; and the first tone set is used to transmit the first indication information, the second tone set is used to transmit third indication information sent by the second terminal device to the access point device, and the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

[0013] According to the foregoing design, the second terminal device may accurately report, to the access point device by using different tone sets, whether there is the to-be-transmitted first uplink data.

[0014] In a possible design, the access point device receives the first indication information sent by the first terminal device, where the first indication information is associated with a traffic indication frame sent by the second terminal device to the first terminal device, and the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data.

[0015] According to the foregoing design, the first terminal device may accurately report, to the access point device based on the traffic indication frame sent by the second terminal, whether there is the to-be-transmitted first uplink data.

[0016] Optionally, the first indication information is carried in an uplink PPDU frame.

[0017] In a possible design, the access point device sends a first request message to the first terminal device, where the first request message is used to request second TXS time in the TXOP, and the second TXS time includes the first TXS time.

[0018] According to the foregoing design, when the TXOP holder is the first terminal device, the access point device may request, from the first terminal device, the second TXS time that is in the TXOP and that includes the first TXS time, so that the first terminal device can determine an occasion for sharing the TXOP.

[0019] Optionally, the second TXS time further includes third TXS time, and the third TXS time is earlier than the first TXS time.

[0020] In a possible design, the access point device sends second request information to the second terminal device within the third TXS time, where the second request information is used to request the second terminal device to report whether there is the to-be-transmitted first uplink data.

[0021] According to the foregoing design, a manner in which the access point device queries the second terminal device whether there is the to-be-transmitted first uplink data is provided.

[0022] In a possible design, the access point device sends fourth indication information to the

first terminal device, where the fourth indication information indicates the first terminal device to stop sending second uplink data within the third TXS time.

[0023] According to the foregoing design, the first terminal device stops sending the second uplink data within the third TXS time, so that impact on a case in which the access point device queries whether the second terminal device has the to-be-transmitted first uplink data can be avoided.

[0024] Optionally, the second request message is carried in an NFRP frame, and the first indication information is carried in an NFR frame.

[0025] In a possible design, the access point device sends a downlink PPDU frame to the second terminal device, where the downlink PPDU frame is used to carry to-be-sent downlink data and the second request message.

[0026] According to the foregoing design, when sending the downlink PPDU frame, the access point device may query the second terminal device whether there is the to-be-transmitted first uplink data, so that unnecessary signaling transmission can be reduced, and signaling overheads can be reduced.

[0027] Optionally, the first indication information is carried in an acknowledgment frame or a response frame, and the acknowledgment frame or the response frame corresponds to the downlink PPDU frame.

[0028] In a possible design, the access point device receives third indication information, where the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data; and sends fifth indication information to the first terminal device, where the fifth indication information indicates that the TXS time ends. Alternatively, the access point device receives, within the first TXS time, the first uplink data sent by the second terminal device; and sends fifth indication information to the first terminal device, where the fifth indication information indicates that the TXS time ends.

[0029] According to the foregoing design, because the current TXOP holder is the first terminal device, after the access point device schedules the second terminal device to perform uplink transmission, or when the second terminal device has no to-be-transmitted first uplink data, the access point device is used to indicate that the first TXS time ends, and the first terminal device may continue to perform data transmission, so that normal running of a traffic of the first terminal device can be ensured.

[0030] Optionally, the to-be-transmitted first uplink data is LLT data.

[0031] In a possible design, the access point device sends sixth indication information to the first terminal device, where the sixth indication information indicates the first terminal device not to transmit uplink data within the first TXS time; or the access point device sends seventh

indication information to the first terminal device, where the seventh indication information indicates the first terminal device to transmit low latency traffic data within the first TXS time.

[0032] According to the foregoing design, the access point device may indicate the first terminal device to transmit the low latency traffic data within the first TXS time, or indicate the first terminal device not to transmit the uplink data within the first TXS time.

[0033] Optionally, the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

[0034] According to a second aspect, an embodiment of this application provides a communication method. The method may be applied to a second terminal device side, for example, a second terminal device or a communication module in a second terminal device, a circuit or a chip (for example, a modem (Modem) chip, also referred to as a baseband (baseband) chip, a system on chip (system on chip, SoC) chip including a modem core, or a system in package (system in package, SIP) chip) responsible for a communication function in a second terminal device. For example, the method is applied to the second terminal device. In the method, when a TXOP holder is the first terminal device, the second terminal device receives second indication information sent by an access point device, where the second indication information indicates to send first uplink data within first TXS time, and the first TXS time is a resource in the TXOP; and the second terminal device sends the first uplink data within the first TXS time.

[0035] According to the foregoing method, when the TXOP holder is the first terminal device, the second terminal device may perform uplink transmission within the first TXS time in the TXOP after receiving the second indication information sent by the access point device. In this way, after the second terminal device generates to-be-transmitted uplink data, long waiting time can be avoided, and data transmission reliability of the second terminal device can be improved. For example, when the first uplink data to be transmitted by the second terminal device is low latency traffic LLT data, waiting time of the second terminal device can be reduced, and traffic transmission reliability of the second terminal device can be improved.

[0036] In a possible design, the second terminal device sends first indication information to the access point device in a first frequency domain resource, where the first indication information indicates that the second terminal device has the to-be-transmitted first uplink data; and the first frequency domain resource is a part of frequency domain resources within a transmission bandwidth of the first terminal device, or the first frequency domain resource is a frequency domain resource outside the transmission bandwidth of the first terminal device.

[0037] Optionally, the first frequency domain resource includes a plurality of tone sets corresponding to the second terminal device, and the plurality of tone sets include a first tone set and a second tone set; and the first tone set is used to transmit the first indication information, the

second tone set is used to transmit third indication information sent by the second terminal device to the access point device, and the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

[0038] According to the foregoing design, the second terminal device may accurately report, to the access point device by using different tone sets, whether there is the to-be-transmitted first uplink data.

[0039] In a possible design, the second terminal device sends a traffic indication frame to the first terminal device, where the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data.

[0040] According to the foregoing design, the first terminal device may accurately determine, based on the traffic indication frame sent by the second terminal, whether the second terminal device has the to-be-transmitted first uplink data.

[0041] In a possible design, the second terminal device sends first indication information to the access point device, where the first indication information indicates that the second terminal device has the to-be-transmitted first uplink data.

[0042] According to the foregoing design, the second terminal device may indicate, to the access point device, to-be-transmitted first uplink data.

[0043] In a possible design, the second terminal device receives, within third TXS time, a second request message sent by the access point device, where the second request message is used to request the second terminal device to report whether there is the to-be-transmitted first uplink data, and the third TXS time is earlier than the first TXS time.

[0044] According to the foregoing design, a manner in which the access point device queries the second terminal device whether there is the to-be-transmitted first uplink data is provided.

[0045] Optionally, the second request message is carried in an NFRP frame, and the first indication information is carried in an NFR frame.

[0046] In a possible design, the second terminal device receives a downlink PPDU frame sent by the access point device, where the downlink PPDU frame is used to carry downlink data generated by the access point device and the second request message.

[0047] Optionally, the first indication information is carried in an acknowledgment frame or a response frame, and the acknowledgment frame or the response frame corresponds to the downlink PPDU frame.

[0048] Optionally, the first uplink data to be transmitted by the second terminal device is LLT data.

[0049] Optionally, the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

[0050] According to a third aspect, an embodiment of this application provides a communication method. The method may be applied to a first terminal device side, for example, a first terminal device or a communication module in a first terminal device, or a circuit or a chip (for example, a modem (Modem) chip, also referred to as a baseband (baseband) chip, or an SoC chip or a SIP chip including a modem core) responsible for a communication function in a first terminal device. For example, the method is applied to the first terminal device. In the method, when a TXOP holder is the first terminal device, the first terminal device receives first request information, where the first request information is used to request first TXS time in the TXOP, and the first TXS time is used by a second terminal device to send first uplink data; and the first terminal device sends second uplink data to an access point device in a resource in the TXOP.

[0051] According to the foregoing method, when the TXOP holder is the first terminal device, a part or all of the time in the TXOP may be used as the first TXS time, and the second terminal device may perform uplink transmission within the first TXS time. In this way, after the second terminal device generates to-be-transmitted uplink data, long waiting time can be avoided, and data transmission reliability of the second terminal device can be improved. For example, when the first uplink data to be transmitted by the second terminal device is low latency traffic LLT data, waiting time of the second terminal device can be reduced, and traffic transmission reliability of the second terminal device can be improved.

[0052] In a possible design, the first terminal device receives the first request information sent by the access point device.

[0053] According to the foregoing design, when the TXOP holder is the first terminal device, the first terminal device may determine an occasion for sharing the TXOP after receiving the first request message.

[0054] In a possible design, the first terminal device receives a traffic indication frame sent by the second terminal device, where the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data; and the first terminal device sends first indication information to the access point device, where the first indication information indicates that the second terminal device has the to-be-transmitted first uplink data.

[0055] According to the foregoing design, the first terminal device may accurately determine, based on the traffic indication frame sent by the second terminal, whether the second terminal device has the to-be-transmitted first uplink data.

[0056] Optionally, the first indication information is carried in an uplink PPDU frame.

[0057] In a possible design, the first terminal device receives fifth indication information sent by the access point device, where the fifth indication information indicates that the TXS time ends.

[0058] According to the foregoing design, after the access point device is used to indicate that

the first TXS time ends, the first terminal device may continue to perform data transmission, so that normal running of a traffic of the first terminal device can be ensured.

[0059] Optionally, the to-be-transmitted first uplink data is LLT data.

[0060] Optionally, the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

[0061] According to a fourth aspect, this application provides a communication apparatus. The communication apparatus has a function of implementing the first aspect. The communication apparatus may include a corresponding module, unit, or means (means) for performing an operation in the first aspect. The module, unit, or means may be specifically implemented by using software, or may be implemented by using hardware, or may be implemented by using a combination of software and hardware. For example, the communication apparatus includes a communication unit and a processing unit, to perform any possible implementation of the first aspect. The communication unit is configured to perform sending and receiving operations, for example, functions related to sending and receiving. The communication unit may be referred to as a transceiver unit. Optionally, the communication unit includes a receiving unit and a sending unit. The processing unit is configured to perform a processing operation.

[0062] In a design, the communication apparatus is a communication chip. The processing unit may be one or more processors or processor cores, and the communication unit may be an input/output circuit, an input/output interface, or an antenna port of the communication chip.

[0063] In another design, the communication unit may be a transmitter and a receiver, or the communication unit may be a transmitter machine and a receiver machine.

[0064] Optionally, the communication apparatus further includes modules that may be configured to perform any possible implementation of the first aspect.

[0065] According to a fifth aspect, this application provides a communication apparatus. The communication apparatus has a function of implementing the second aspect. The communication apparatus may include a corresponding module, unit, or means (means) for performing an operation in the second aspect. The module, unit, or means may be specifically implemented by using software, or may be implemented by using hardware, or may be implemented by using a combination of software and hardware. For example, the communication apparatus includes a communication unit and a processing unit, to perform any possible implementation of the second aspect. The communication unit is configured to perform sending and receiving operations, for example, functions related to sending and receiving. The communication unit may be referred to as a transceiver unit. Optionally, the communication unit includes a receiving unit and a sending unit. The processing unit is configured to perform a processing operation.

[0066] In a design, the communication apparatus is a communication chip. The processing unit

may be one or more processors or processor cores, and the communication unit may be an input/output circuit, an input/output interface, or an antenna port of the communication chip.

[0067] In another design, the communication unit may be a transmitter and a receiver, or the communication unit may be a transmitter machine and a receiver machine.

[0068] Optionally, the communication apparatus further includes modules that may be configured to perform any possible implementation of the second aspect.

[0069] According to a sixth aspect, a communication apparatus is provided. The communication apparatus may be the foregoing access point device, the second terminal device, or the first terminal device. The communication apparatus may include a processor and a memory, to perform any one of the first aspect to the third aspect or perform any possible implementation of the first aspect to the third aspect. Optionally, the communication apparatus further includes a transceiver. The memory is configured to store a computer program or instructions. The processor is configured to invoke the computer program or the instructions from the memory and run the computer program or the instructions. When the processor executes the computer program or the instructions in the memory, the communication apparatus is enabled to perform any one of the first aspect and the third aspect or any possible implementation of the first aspect and the third aspect.

[0070] Optionally, there are one or more processors, and there are one or more memories.

[0071] Optionally, the memory may be integrated with the processor, or the memory and the processor are disposed separately.

[0072] Optionally, the transceiver may include a transmitter machine (transmitter) and a receiver machine (receiver).

[0073] According to a seventh aspect, a communication apparatus is provided. The communication apparatus may be the foregoing access point device, the second terminal device, or the first terminal device. The communication apparatus may include a processor, to perform any one of the first aspect to the third aspect or perform any possible implementation of the first aspect to the third aspect. The processor is coupled to a memory. Optionally, the communication apparatus further includes the memory. Optionally, the communication apparatus further includes a communication interface, and the processor is coupled to the communication interface.

[0074] In an implementation, when the communication apparatus is the access point device, the second terminal device, or the first terminal device, the communication interface may be a transceiver or an input/output interface. Optionally, the transceiver may be a transceiver circuit. Optionally, the input/output interface may be an input/output circuit.

[0075] In another implementation, when the communication apparatus is a chip or a chip system, the communication interface may be an input/output interface, an interface circuit, an output circuit, an input circuit, a pin, a related circuit, or the like on the chip or the chip system.

The processor may alternatively be embodied as a processing circuit or a logic circuit.

[0076] According to an eighth aspect, this application provides a communication apparatus. The communication apparatus includes a processor, and may further include a storage medium. The storage medium stores a computer program or instructions. When the computer program or the instructions are executed by the processor, the method according to any one of the possible designs of the first aspect to the third aspect is implemented. The communication apparatus may be a chip system. The chip system may include a chip, or may include a chip and another discrete device.

[0077] According to a ninth aspect, a communication system is provided. The communication system includes the access point device according to the first aspect, the second terminal device according to the second aspect, and the first terminal device according to the third aspect.

[0078] According to a tenth aspect, this application further provides a chip, including a processor. The processor is coupled to a memory and is configured to read and execute a computer program or instructions stored in the memory, so that the chip implements the method according to any one of the possible designs of the first aspect to the third aspect.

[0079] According to an eleventh aspect, this application provides a computer-readable storage medium. The computer storage medium stores a computer program or instructions, and when a computer reads and executes the computer program or the instructions, the computer is enabled to perform the method according to any one of the possible designs of first aspect to the third aspect.

[0080] According to a twelfth aspect, this application provides a computer program product. When a computer reads and executes the computer program product, the computer is enabled to perform the method according to any one of the possible designs of first aspect to the third aspect.

[0081] For the aspects in the fourth aspect to the twelfth aspect and technical effect that may be achieved in the aspects, refer to the descriptions of the technical effect that can be achieved in any one of the first aspect, the second aspect, the third aspect, or the possible solutions in the aspects. Details are not described herein again.

BRIEF DESCRIPTION OF DRAWINGS

[0082] FIG. 1 is a diagram of a network architecture of a WLAN according to an embodiment of this application;

[0083] FIG. 2 is a flowchart of a communication method according to an embodiment of this application;

[0084] FIG. 3A is a diagram of multiplexing a first frequency domain resource by a plurality of second terminal devices according to an embodiment of this application;

[0085] FIG. 3B is a flowchart of sharing a TXOP by a first terminal device according to an embodiment of this application;

[0086] FIG. 4 is a diagram of transmitting LLT_IF frames by a plurality of second terminal devices according to an embodiment of this application;

[0087] FIG. 5 is a flowchart of sharing a TXOP by a first terminal device according to an embodiment of this application;

[0088] FIG. 6 is a flowchart of sharing a TXOP by a first terminal device according to an embodiment of this application;

[0089] FIG. 7 is a flowchart of sharing a TXOP by a first terminal device according to an embodiment of this application;

[0090] FIG. 8 is a diagram of a structure of a communication apparatus according to an embodiment of this application; and

[0091] FIG. 9 is a diagram of a structure of a communication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[0092] In embodiments of this application, "at least one" means one or more, and "a plurality of" means two or more than two. 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 cases: Only A exists, both A and B exist, and only B exists, where A and B may be singular or plural. The character "/" generally indicates an "or" relationship between the associated objects. "At least one of the following" or a similar expression thereof indicates any combination of these items, including a single item (piece) or any combination of a plurality of items (pieces). For example, at least one item (piece) 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 each of a, b, c may be an element, or may be a set including one or more elements.

[0093] In this application, "for example", "in some embodiments", "in some other embodiments", and the like are used to represent giving an example, an illustration, or a description. Any embodiment or design solution described as an "example" in this application should not be explained as being more preferred or having more advantages than another embodiment or design solution. Exactly, the term "example" is for presenting a concept in a specific manner.

[0094] "Of (of)", "corresponding (corresponding, relevant)", and "corresponding (corresponding)" in this application may be interchangeably used sometimes. It should be noted that expressed meanings are consistent when differences are not emphasized. In embodiments of

this application, communication and transmission may be interchangeably used sometimes. It should be noted that expressed meanings are consistent when differences are not emphasized. For example, transmission may include sending and/or receiving, and may be a noun or a verb.

[0095] It should be noted that in embodiments of this application, words such as "first" and "second" are merely used for distinction and description, and cannot be understood as an indication or implication of relative importance or an indication or implication of a sequence.

[0096] Embodiments of this application are applicable to a local area network (local area network, LAN), and in particular, a WLAN, for example, a WLAN that uses any one of the institute of electrical and electronics engineers (institute of electrical and electronics engineers, IEEE) 802.11 series protocols. The WLAN may include one or more basic service sets (basic service sets, BSSs). Network nodes in the basic service set include an access point (access point, AP) and a station (station, STA).

[0097] Embodiments of this application are also applicable to a wireless local area network like an internet of things (internet of things, IoT) network or a vehicle-to-everything (vehicle to X, V2X) network. Certainly, embodiments of this application are further applicable to other possible communication systems, for example, a long term evolution (long term evolution, LTE) communication system, an LTE frequency division duplex (frequency division duplex, FDD) communication system, an LTE time division duplex (time division duplex, TDD) communication 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 5th generation (5th generation, 5G) communication system, and a future evolved communication system.

[0098] The following uses an example in which embodiments of this application are applicable to the WLAN. FIG. 1 is a diagram of a network architecture of a WLAN to which embodiments of this application are applicable. FIG. 1 uses an example in which the WLAN includes one AP and two STAs. AN STA associated with the AP can receive a frame sent by the AP, and can also send a frame to the AP. Embodiments of this application are described by using communication between the AP and the STA as an example. It may be understood that embodiments of this application are also applicable to communication between APs. For example, the APs may communicate with each other through a distributed system (distributed system, DS). Embodiments of this application are also applicable to communication between STAs.

[0099] The AP may be an access point for a terminal device (for example, a mobile phone) to access a wired (or wireless) network. The AP is equivalent to a bridge that connects the wired network and the wireless network, and a main function is to connect various wireless network clients together and then connect the wireless network to the Ethernet. For example, the AP may

be a terminal device (for example, a mobile phone) or a network device (for example, a router) with a Wi-Fi chip. In embodiments of this application, the AP may be a device that supports the 802.11be standard, or may be a device that supports a plurality of WLAN standards of the 802.11 series, such as 802.11ax, 802.11ay, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a, and a next generation of 802.11be.

[00100] The STA may be a wireless communication chip, a wireless sensor, a wireless communication terminal, or the like, and may also be referred to as a user. For example, the STA may be a mobile phone that supports a Wi-Fi communication function, a tablet computer that supports a Wi-Fi communication function, a set top box that supports a Wi-Fi communication function, a smart television that supports a Wi-Fi communication function, a smart wearable device that supports a Wi-Fi communication function, a vehicle-mounted communication device that supports a Wi-Fi communication function, and a computer that supports a Wi-Fi communication function. Optionally, the STA may support the 802.11be standard, or may support the plurality of WLAN standards of the 802.11 series, such as 802.11ax, 802.11ay, 802.11ac, 802.11n, 802.11g, 802.11b, 802.11a, and the next generation of 802.11be.

[00101] It may be understood that quantities of APs and STAs shown in FIG. 1 are merely examples, and may be larger or smaller.

[00102] For ease of understanding of embodiments of this application, several basic concepts in embodiments of this application are briefly described.

[00103] 1. TXOP: A TXOP is a transmit opportunity in a wireless network. In the wireless network, a TXOP holder (for example, an AP or an STA) may transmit data within a specific time period, and the TXOP holder may continuously transmit data in the TXOP without being interrupted by another device.

[00104] For example, when the TXOP holder is an AP, the AP may continuously send downlink data to an associated STA in the TXOP, while the STA associated with the AP cannot send uplink data to the AP in the TXOP; or when the TXOP holder is an STA 1, the STA 1 may continuously send uplink data to an associated AP in the TXOP, while another STA associated with the AP cannot send uplink data to the AP in the TXOP.

[00105] 2. TXOP sharing: TXOP sharing refers to a manner in which a plurality of devices share a same TXOP in a wireless local area network or another wireless communication network. In conventional wireless local area network communication, the TXOP is usually allocated to an STA by an associated AP, and the STA is allowed to continuously transmit uplink data to the associated AP within time corresponding to the TXOP. TXOP sharing may be understood as that, when a TXOP holder is an AP, the AP may use a part of time in the TXOP as TXS time, and schedule an associated STA to perform uplink transmission within the TXS time.

[00106] 3. Reverse TXOP sharing: When a TXOP holder is a non-access-point STA (non-AP STA), the STA shares a part of time (TXS time) in the TXOP with an associated AP for data transmission, or uses a part of time (TXS time) in the TXOP for the associated AP to schedule an STA other than the TXOP holder STA to transmit uplink data.

[00107] For a reverse TXOP sharing mechanism in the wireless local area network, when the TXOP holder is an STA of a non-access point, the STA may share a part of time in the TXOP as TXS time with an associated AP or an STA other than the TXOP holder STA, to meet transmission needs of an associated AP or another STA. For example, within the TXS time in the TXOP of the STA, the AP may schedule another STA to perform uplink transmission (for example, when the TXOP holder is the STA 1, within the TXS time in the TXOP, the AP may send a Trigger frame to schedule the STA 2 to perform uplink data transmission). If the STA 2 has buffered uplink low latency traffic (low latency traffic, LLT) data, the STA 2 may perform uplink LLT data preemption transmission within the TXS time in the TXOP of the STA 1, without waiting for the TXOP of the STA 1 to end, thereby effectively reducing a latency. Alternatively, the AP may perform downlink transmission within TXS time in the TXOP of the STA (for example, the AP may send a downlink multi-user physical protocol data unit (multi-user physical protocol data unit, MU PPDU)). Alternatively, the AP may schedule, within TXS time in the TXOP of the STA, another AP to perform AP coordination.

[00108] However, when the TXOP holder is the STA, if the TXS time in the TXOP of the STA is shared with another STA associated with the same AP, the associated AP may schedule, within the TXS time, the another STA to perform uplink transmission. However, when the AP does not determine whether another STA has to-be-transmitted uplink data, the AP cannot perform accurate scheduling within the TXS time.

[00109] Based on this, an embodiment of this application provides a communication method. When the TXOP holder is the first terminal device, when determining that the second terminal device has to-be-transmitted uplink data, the access point device may schedule the second terminal device to perform uplink transmission within the TXS time in the TXOP. The first terminal device and the second terminal device are associated with the access point device.

[00110] With reference to FIG. 2, the following describes a communication method in an embodiment of this application. The method may include the following steps.

[00111] Step 200: When a TXOP holder is a first terminal device, an access point device receives first indication information. The first indication information indicates that a second terminal device has to-be-transmitted first uplink data.

[00112] The access point device in this embodiment of this application may be an AP, and the first terminal device may be an STA. For example, the access point device is an AP associated with

(or accessed by) the first terminal device, and the first terminal device may be a non-access-point STA (non-AP STA).

[00113] Optionally, the second terminal device and the first terminal device may be terminal devices in a same TXOP sharing terminal group. The second terminal device is associated with the access point device (which may also be understood as that the first terminal device and the second terminal device access a same access point device).

[00114] In this embodiment of this application, a plurality of terminal devices (for example, may be terminal devices that are non-access points) may form a TXOP sharing terminal group. Terminal devices in a same TXOP sharing terminal group may share TXOPs held by one terminal device or a plurality of terminal devices. Optionally, terminal devices in one TXOP sharing terminal group may be associated with a same access point device.

[00115] The access point device may manage a member in the TXOP sharing terminal group. For example, the access point device and the terminal device negotiate, by exchanging a management frame that carries a specified element, whether the terminal device joins or exits the TXOP sharing terminal group. After obtaining the TXOP, any terminal device in the TXOP sharing terminal group may enable an inverse TXOP sharing function by default, and any terminal device in the TXOP sharing terminal group may share a TXOP of another terminal device in the group for uplink transmission.

[00116] It may be understood that the TXOP in step 200 is a time interval allocated to the first terminal device for data transmission. In the TXOP, a time period may be determined as TXS time, the TXS time may be used for inverse TXOP sharing, and the access point device may schedule, within the TXS time, a second terminal device other than the first terminal device in the terminal devices associated with the AP to perform uplink transmission.

[00117] In step 200, the access point device may receive the first indication information sent by the second terminal device, or the access point device may receive the first indication information sent by the first terminal device. The first indication information indicates that the second terminal device has the to-be-transmitted first uplink data.

[00118] In this embodiment of this application, the first terminal device or the second terminal device may send the first indication information to the access point device when determining that the second terminal device has the to-be-transmitted first uplink data; or may not notify the access point device when determining that the second terminal device has no to-be-transmitted first uplink data. Alternatively, in this embodiment of this application, the first terminal device or the second terminal device may send the first indication information to the access point device when determining that the second terminal device has the to-be-transmitted first uplink data; or send third indication information to the access point device when determining that the second terminal

device has no to-be-transmitted uplink data, where the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

[00119] In an optional application scenario, the first uplink data to be transmitted by the second terminal device may be LLT data (low latency data). When the current TXOP holder is the first terminal device, because the first uplink data to be transmitted by the second terminal device is low latency traffic data, the second terminal device may report that there is to-be-transmitted first uplink data to the access point device.

[00120] Step 201: The access point device sends second indication information to a second terminal device. Correspondingly, the second terminal device receives the second indication information sent by the access point device. The second indication information indicates the second terminal device to send the first uplink data within first TXS time.

[00121] The first TXS time is a resource in the TXOP. For example, the first TXS time may be a part or all of time in the TXOP.

[00122] In this embodiment of this application, the first TXS time may be determined in the TXOP of the first terminal device, and the first TXS time may be used by the second terminal device to send the first uplink data.

[00123] Optionally, the access point device may send the second indication information to the second terminal device within the first TXS time. For example, the second indication information may be a Trigger frame.

[00124] Step 202: The second terminal device sends the first uplink data within the first TXS time.

[00125] Optionally, after receiving the second indication information sent by the access point device, the second terminal device may send the first uplink data to the access point device within the first TXS time. For example, the second terminal device transmits an uplink PPDU frame to the access point device, where the uplink PPDU frame carries the first uplink data.

[00126] The following describes a detailed procedure of the communication method in embodiments of this application with reference to different embodiments.

[00127] Embodiment 1:

[00128] When a TXOP holder is a first terminal device, a second terminal device may report, to an access point device, whether there is to-be-transmitted first uplink data.

[00129] The following describes a manner in which the second terminal device reports, to the access point device, whether there is the to-be-transmitted first uplink data.

[00130] The second terminal device may report first indication information to the access point device when there is the to-be-transmitted first uplink data, and report third indication information to the access point device when there is no to-be-transmitted first uplink data. During

implementation, the second terminal device may periodically report the first indication information or the third indication information to the access point device. Alternatively, the second terminal device reports the first indication information to the access point device only when there is the to-be-transmitted first uplink data. During implementation, the second terminal device may report the first indication information to the access point device in real time when buffering the first uplink data.

[00131] Optionally, the second terminal device may send first indication information to the access point device in a first frequency domain resource. Correspondingly, the access point device receives, in the first frequency domain resource, the first indication information sent by the second terminal device. The first indication information indicates that the second terminal device has the to-be-transmitted first uplink data. Alternatively, the second terminal device may send the third indication information to the access point device in a first frequency domain resource. Correspondingly, the access point device receives, in the first frequency domain resource, the third indication information sent by the second terminal device. The third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

[00132] The first frequency domain resource is a part of frequency domain resources within a transmission bandwidth of the first terminal device, or the first frequency domain resource is a frequency domain resource outside the transmission bandwidth of the first terminal device. For example, when the first frequency domain resource is a part of frequency domain resources within the transmission bandwidth of the first terminal device, the part of frequency domain resources may be specified as the first frequency domain resource within the transmission bandwidth of the first terminal device. For another example, when the first frequency domain resource is a frequency domain resource outside the transmission bandwidth of the first terminal device, a part of frequency domain resources may be specified as the first frequency domain resource outside the transmission bandwidth of the first terminal device.

[00133] To prevent another device from contending for a channel, after the first terminal device sends a request to send (request to send, RTS) frame to the access point device in a transmission bandwidth, the access point device may reply with a clear to send (clear to send, CTS) frame in a wider bandwidth. For example, the first terminal device transmits the RTS in a bandwidth of 80 MHz, and the access point device may reply with the CTS in a bandwidth of 100 MHz. 20 MHz is used by the second terminal device to send the first indication information or the third indication information, to report whether there is the to-be-transmitted first uplink data.

[00134] When there are a plurality of second terminal devices, the plurality of second terminal devices may all report information (for example, the first indication information or the third indication information) to the access point device in the first frequency domain resource. For

example, the second terminal device may report information to the access point device in an HE-LTF tone mapping manner based on a high efficiency (HE) Trigger (TB) feedback (feedback) null data physical protocol data unit (null data PPDU, NDP). For example, when the first frequency domain resource is 20 MHz, 18 second terminal devices may be supported to report information.

[00135] After the second terminal device buffers the first uplink data, according to the HE-LTF tone mapping manner of the HE TB feedback NDP specified in the protocol, the second terminal device may report information on a tone that is in the first frequency domain resource and that corresponds to the second terminal device. For example, the first frequency domain resource may include a plurality of tone sets corresponding to the second terminal device, and the plurality of tone sets include a first tone set and a second tone set. The first tone set may be used to transmit the first indication information, and the second tone set may be used to transmit the third indication information. In addition, the plurality of tone sets corresponding to the second terminal device may further include a third tone set, and the second terminal device may further feed back a data amount of the first uplink data by using the third tone set.

[00136] When there are a large quantity of second terminal devices, in an optional implementation, a plurality of second terminal devices may multiplex the first frequency domain resource in a time division multiple access (time division multiple access, TDMA) manner. For example, as shown in FIG. 3A, a plurality of second terminal devices may multiplex the first frequency domain resource to report information in different time periods. A second terminal group (group) 1 reports information in the first frequency domain resource within time T_1, a second terminal group (group 2) reports information in the first frequency domain resource within time T_2, and so on. A second terminal group (group N) reports information in a first frequency domain resource within T_N time, where N is a quantity of TDMA slots, or N is a quantity of orthogonal frequency division multiplexing technology (orthogonal frequency division multiplexing, OFDM) symbols. For example, when a bandwidth of the first frequency domain resource is 20 MHz, the first frequency domain resource may be used to support 18*N second terminal devices, and each second terminal group may include 18 second terminal devices. In another optional implementation, a plurality of second terminal devices may be grouped into a plurality of second terminal groups, and each second terminal group corresponds to a plurality of tone sets. When a second terminal device in the second terminal group buffers the first uplink data, the second terminal device sends the first indication information on the first tone set in the plurality of tone sets corresponding to the second terminal group to which the second terminal device belongs, to indicate that the second terminal device in the second terminal group has the to-be-transmitted first uplink data. In addition, the access point device and the plurality of second terminal devices may negotiate RU_TONE_SET_INDEX, a group number, and the like outside the TXOP through frame

interaction.

[00137] After receiving the first indication information sent by the second terminal device, when the access point device determines that the second terminal device has the to-be-transmitted first uplink data, the access point device may request first TXS time from the first terminal device. Specifically, the access point device may send the first request message to the first terminal device. Correspondingly, the first terminal device receives the first request message sent by the access point device. The first request message is used to request the first TXS time in the TXOP.

[00138] For example, first request information may be carried in a first block acknowledgment (Block acknowledgment, BlockAck) frame sent by the access point device to the first terminal device. After the access point device receives the first indication information sent by the second terminal device, the access point device may send the first BlockAck frame to the first terminal device. The first BlockAck frame may carry the first request information that is used to request the first TXS time. For example, a Reserved (Reserved) field in the first BlockAck frame may carry the first request information. A 1-bit Reserved subfield in a Control field in the first BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 1, it indicates that the first TXS time is requested.

[00139] In this embodiment of this application, after receiving the first request information, the first terminal device may determine to start reverse TXOP sharing. For example, a time point at which the first terminal device receives the first request information may be used as a start time of the first TXS time, or a time point at which the access point device sends the first request information to the first terminal device may be used as a start time of the first TXS time.

[00140] In an optional implementation, the access point device may send sixth indication information to the first terminal device, where the sixth indication information indicates the first terminal device not to transmit uplink data within the first TXS time. Correspondingly, the first terminal device receives the sixth indication information sent by the access point device.

[00141] The sixth indication information and the first request information may be two pieces of independently sent information; or the sixth indication information and the first request information may be carried in a same piece of information for sending; or the sixth indication information may be carried in the first request information for sending. If the sixth indication information and the first request information are carried in same information and sent to the first terminal device, after receiving the information, the first terminal device may determine to start reverse TXOP sharing (starting from the first TXS time), and determine not to transmit the uplink data within the first TXS time. If the sixth indication information is carried in the first request information and sent to the first terminal device, after receiving the first request message, the first terminal device may also determine to start reverse TXOP sharing (starting from the first TXS

time), and determine not to transmit the uplink data within the first TXS time.

[00142] In another optional implementation, the access point device may send seventh indication information to the first terminal device, where the seventh indication information indicates the first terminal device to transmit low latency traffic data within the first TXS time. Correspondingly, the first terminal device receives the seventh indication information sent by the access point device. Specifically, the seventh indication information may indicate that the first terminal device transmits the low latency traffic data within the first TXS time, and the first terminal device needs to wait until the first TXS time ends and then transmit non-low-latency traffic data.

[00143] The seventh indication information and the first request information may be two pieces of independently sent information; or the seventh indication information and the first request information may be carried in a same piece of information for sending; or the seventh indication information may be carried in the first request information. If the seventh indication information and the first request information are carried in same information and sent to the first terminal device, after receiving the information, the first terminal device may determine to start reverse TXOP sharing (starting from the first TXS time), and determine that uplink data of the low latency traffic can be transmitted within the first TXS time. If the seventh indication information is carried in the first request information and sent to the first terminal device, after receiving the first request message, the first terminal device may also determine to start reverse TXOP sharing (starting from the first TXS time), and determine that the uplink data of the low latency traffic can be transmitted within the first TXS time.

[00144] The access point device sends second indication information to the second terminal device within the first TXS time. Correspondingly, the second terminal device receives the second indication information sent by the access point device. The second indication information indicates the second terminal device to send the first uplink data within the first TXS time. For example, the access point device may send a Trigger frame to the second terminal device, and schedule, by using the Trigger frame, the second terminal device to perform uplink transmission. After receiving the second indication information, the second terminal device may send the first uplink data to the access point device. For example, the second terminal device sends an uplink PPDU frame to the access point device, and the uplink PPDU frame may carry the first uplink data.

[00145] Within the first TXS time, the access point device may schedule the second terminal device to send the first uplink data. In addition, the first terminal device may also transmit second uplink data within the first TXS time. For example, when the first terminal device buffers LLT data, the first terminal device may transmit the LLT data within the first TXS time. To avoid a resource conflict, the first terminal device and the second terminal device may transmit the uplink

data in different time domain resources within the first TXS time.

[00146] After receiving the first uplink data sent by the second terminal device, the access point device may further send fifth indication information to the first terminal device, where the fifth indication information indicates that the first TXS time ends. Optionally, the fifth indication information is carried in a second BlockAck frame sent by the access point device to the first terminal device. For example, a Reserved field in the second BlockAck frame may carry fourth indication information. A 1-bit Reserved subfield in a Control field in the second BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 0, it indicates that the first TXS time ends.

[00147] Because the current TXOP holder is the first terminal device, after the access point device schedules the second terminal device to perform uplink transmission, the access point device is used to indicate that the first TXS time ends, and the first terminal device may continue to perform data transmission. Therefore, when the second terminal device has low latency traffic data, the second terminal device may perform uplink transmission within the first TXS time in the TXOP of the first terminal device, to improve traffic reliability of the second terminal device. In addition, after the second terminal device transmits the low latency traffic data, the first terminal device may continue to transmit data within remaining time in the TXOP, so that normal running of a traffic of the first terminal device can also be ensured.

[00148] The following uses FIG. 3B as an example to describe a procedure in which the first terminal device shares the TXOP.

[00149] In FIG. 3B, an example in which the first terminal device is an STA 1, and the two second terminal devices are an STA 2 and an STA 3 is used for description.

[00150] When the TXOP holder is the STA 1, in the TXOP, the STA 1 sends an RTS frame that may be used to request to transmit the second uplink data. After receiving the RTS frame sent by the STA 1, an AP (access point device) sends a CTS frame or an NFRP frame to the STA 1. After receiving the CTS frame or the NFRP frame, the STA 1 may send the second uplink data to the access point device. For example, the STA 1 sends an uplink PPDU frame to the AP, and the uplink PPDU frame may carry the second uplink data.

[00151] When the STA 2 buffers the first uplink data, the STA 2 sends a null data physical protocol data unit feedback report (NDP feedback report, NFR) frame to the AP. The NFR frame may carry first indication information indicating that the STA 2 has the to-be-transmitted first uplink data. When the STA 3 buffers the first uplink data, the STA 3 sends an NFR frame to the AP. The NFR frame may carry first indication information indicating that the STA 3 has the to-be-transmitted first uplink data.

[00152] After receiving the NFR frames sent by the STA 2 and the STA 3, the AP sends a first

BlockAck frame (which may be, for example, a BA w frame or a Preq (preemption request) frame) to the STA 1. The first BlockAck frame may carry the first request information that is used to request the first TXS time in the TXOP of the first terminal device. After sending the first BlockAck frame, the AP may determine that the first TXS time starts.

[00153] Within the first TXS time, the AP transmits a Trigger frame (which may carry the second indication information) indicating the STA 2 and the STA 3 to transmit the first uplink data. The STA 2 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 2. The STA 3 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 3.

[00154] After receiving the first uplink data of the STA 2 and the first uplink data of the STA 3, the AP may transmit a second BlockAck frame, where the second BlockAck frame carries fifth indication information indicating that end time of the first TXS ends. Correspondingly, after receiving the second BlockAck frame, the STA 1 continues to transmit the second uplink data.

[00155] Embodiment 2:

[00156] When a TXOP holder is a first terminal device, and a second terminal device has to-be-transmitted first uplink data, the second terminal device may send a traffic indication frame to the first terminal device. Correspondingly, the first terminal device receives the traffic indication frame sent by the second terminal device. The traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data.

[00157] For example, when the second terminal device generates to-be-transmitted LLT data, the traffic indication frame sent by the second terminal device to the first terminal device may be a low latency traffic indication frame (LLT indication frame, LLT_IF). When there are a plurality of second terminal devices, different second terminal devices use mutually orthogonal training sequences as LLT_IF frames, for example, a Golay sequence and a Walsh code. As shown in FIG. 4, a plurality of second terminal devices may transmit specified sequences on specified tones as LLT_IF frames.

[00158] In this embodiment of this application, the second terminal device may send the traffic indication frame to the first terminal device in a specified time/frequency domain resource.

[00159] After receiving the traffic indication frame sent by the second terminal device, the first terminal device sends first indication information to an access point device. The first indication information indicates that the second terminal device has the to-be-transmitted first uplink data. For example, the first indication information may be carried in an uplink PPDU frame sent by the first terminal device to the access point device.

[00160] In an optional implementation, after receiving the traffic indication frame, the first terminal device determines that first TXS time starts. After receiving the first indication

information sent by the first terminal device, the access point device determines that the first TXS time starts.

[00161] In another optional implementation, after receiving the traffic indication frame, the first terminal device notifies, based on the first indication information, the access point device to request the first TXS time. After receiving the first indication information sent by the first terminal device, the access point device sends a first request message to the first terminal device. Correspondingly, the first terminal device receives the first request message sent by the access point device. The first request message is used to request the first TXS time in the TXOP. For example, the first request information may be carried in a first BlockAck frame sent by the access point device to the first terminal device.

[00162] In this embodiment of this application, after the access point device receives the first indication information sent by the second terminal device, the access point device may send the first BlockAck frame to the first terminal device. The first BlockAck frame may carry the first request information that is used to request the first TXS time. For example, a Reserved field in the first BlockAck frame may carry the first request information. A 1-bit Reserved subfield in a Control field in the first BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 1, it indicates that the first TXS time is requested.

[00163] After receiving the first request information, the first terminal device may determine to start reverse TXOP sharing. For example, a time point at which the first terminal device receives the first request information may be used as a start time of the first TXS time, or a time point at which the access point device sends the first request information to the first terminal device may be used as a start time of the first TXS time.

[00164] In an optional implementation, the access point device may send sixth indication information to the first terminal device, where the sixth indication information indicates the first terminal device not to transmit uplink data within the first TXS time. Correspondingly, the first terminal device receives the sixth indication information sent by the access point device. The sixth indication information may indicate the first terminal device not to transmit the uplink data within the first TXS time. For a relationship between the sixth indication information and the first request message, refer to the descriptions in Embodiment 1. Details are not described herein again.

[00165] In another optional implementation, the access point device may send seventh indication information to the first terminal device, where the seventh indication information indicates the first terminal device to transmit low latency traffic data within the first TXS time. Correspondingly, the first terminal device receives the seventh indication information sent by the access point device. The foregoing seventh indication information may indicate that the first terminal device transmits the low latency traffic data within the first TXS time, and the first

terminal device needs to wait until the first TXS time ends and then transmit non-low-latency traffic data. For a relationship between the seventh indication information and the first request message, refer to the descriptions in Embodiment 1. Details are not described herein again.

[00166] The access point device sends second indication information to the second terminal device within the first TXS time. Correspondingly, the second terminal device receives the second indication information sent by the access point device. The second indication information indicates the second terminal device to send the first uplink data within the first TXS time. For example, the access point device may send a Trigger frame to the second terminal device, and schedule, by using the Trigger frame, the second terminal device to perform uplink transmission. After receiving the second indication information, the second terminal device may send the first uplink data to the access point device. For example, the second terminal device sends an uplink PPDU frame to the access point device, and the uplink PPDU frame may carry the first uplink data.

[00167] Within the first TXS time, the access point device may schedule the second terminal device to send the first uplink data. In addition, the first terminal device may also transmit second uplink data within the first TXS time. For example, when the first terminal device buffers LLT data, the first terminal device may transmit the LLT data within the first TXS time. To avoid a resource conflict, the first terminal device and the second terminal device need to transmit the uplink data in different time domain resources within the first TXS time.

[00168] After receiving the first uplink data sent by the second terminal device, the access point device may send fifth indication information to the first terminal device, where the fifth indication information indicates that the first TXS time ends. For example, the fifth indication information may be carried in a second BlockAck frame sent by the access point device to the first terminal device. For example, a Reserved field in the second BlockAck frame may carry fifth indication information. A 1-bit Reserved subfield in a Control field in the second BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 0, it indicates that the first TXS time ends.

[00169] Because the current TXOP holder is the first terminal device, after the access point device schedules the second terminal device to perform uplink transmission, the access point device is used to indicate that the first TXS time ends, and the first terminal device may continue to perform data transmission. Therefore, when the second terminal device has low latency traffic data, the second terminal device may perform uplink transmission within the first TXS time in the TXOP of the first terminal device, to improve traffic reliability of the second terminal device. In addition, after the second terminal device transmits the low latency traffic data, the first terminal device continues to transmit data within remaining time in the TXOP, so that normal running of a traffic of the first terminal device can also be ensured.

[00170] The following uses FIG. 5 as an example to describe a procedure in which the first terminal device shares the TXOP.

[00171] In FIG. 5, an example in which the first terminal device is an STA 1, and the two second terminal devices are an STA 2 and an STA 3 is used for description.

[00172] When the TXOP holder is the STA 1, in the TXOP, the STA 1 sends an RTS frame that may be used to request to transmit the second uplink data. After receiving the RTS frame sent by the STA 1, an AP (access point device) sends a CTS frame to the STA 1. After receiving the CTS frame, the STA 1 may send the second uplink data to the access point device. For example, the STA 1 sends an uplink PPDU frame to the AP, and the uplink PPDU frame may carry the second uplink data. In addition, when the STA 2 and the STA 3 buffer the first uplink data, the STA 2 and the STA 3 transmit, to the STA 1, LLT_IF frames indicating that the STA 2 and the STA 3 have the to-be-transmitted first uplink data. Correspondingly, after receiving the LLT_IF frames, the AP may carry, in uplink PPDU frames, the first indication information indicating that the STA 2 and the STA 3 have to-be-transmitted first uplink data.

[00173] After receiving the uplink PPDU frame sent by the STA 1, the AP may send a first BlockAck frame (which may be, for example, a BA w frame or a Preq (preemption request) frame) to the STA 1. The first BlockAck frame may carry the first request information that is used to request the first TXS time in the TXOP of the first terminal device. After sending the first BlockAck frame, the AP may determine that the first TXS time starts. Alternatively, after receiving the uplink PPDU frame and obtaining that the uplink PPDU frame includes the first indication information, the AP may determine that the first TXS time starts.

[00174] Within the first TXS time, the AP transmits a Trigger frame (which may carry the second indication information) indicating the STA 2 and the STA 3 to transmit the first uplink data. The STA 2 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 2. The STA 3 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 3.

[00175] After receiving the first uplink data of the STA 2 and the first uplink data of the STA 3, the AP may transmit a second BlockAck frame, where the second BlockAck frame carries fifth indication information indicating that end time of the first TXS ends. Correspondingly, after receiving the second BlockAck frame, the STA 1 continues to transmit the second uplink data.

[00176] Embodiment 3:

[00177] When a TXOP holder is a first terminal device, an access point device may send first request information to the first terminal device. Correspondingly, the first terminal device receives the first request information sent by the access point device, where the first request information is used to request TXS time in the TXOP.

[00178] Optionally, the access point device may periodically send the first request information to the first terminal device in the TXOP. For example, the first request information may be carried in a first BlockAck frame sent by the access point device to the first terminal device.

[00179] In an optional implementation, the access point device may periodically send the first BlockAck frame to the first terminal device. The first BlockAck frame may carry the first request information that is used to request second TXS time. For example, a Reserved field in the first BlockAck frame may carry the first request information. A 1-bit Reserved subfield in a Control field in the first BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 1, it indicates that the TXS time is requested.

[00180] After receiving the first request information, the first terminal device may determine to start reverse TXOP sharing. For example, a time point at which the first terminal device receives the first request information may be used as a start time of the second TXS time, or a time point at which the access point device sends the first request information to the first terminal device may be used as a start time of the second TXS time.

[00181] Optionally, the second TXS time in this embodiment of this application includes first TXS time and third TXS time, and the third TXS time is earlier than the first TXS time. Within the third TXS time, the access point device may request and obtain whether a second terminal device has to-be-transmitted first uplink data. Within the first TXS time, when the second terminal device has to-be-transmitted first uplink data, the access point device may schedule the second terminal device to perform uplink transmission.

[00182] The first terminal device suspends sending second uplink data to the access point device within the first TXS time. The first terminal device may also transmit the second uplink data within the first TXS time. For example, when the first terminal device buffers LLT data, the first terminal device may transmit the LLT data within the first TXS time. To avoid a resource conflict, the first terminal device and the second terminal device need to transmit the uplink data in different time domain resources within the first TXS time.

[00183] Optionally, the access point device may send fourth indication information to the first terminal device, where the fourth indication information indicates the first terminal device to stop sending second uplink data within the third TXS time. Correspondingly, the first terminal device receives the fourth indication information sent by the access point device.

[00184] The fourth indication information and the first request information may be two pieces of independently sent information; or the fourth indication information and the first request information may be carried in a same piece of information for sending; or the fourth indication information may be carried in the first request information for sending. If the fourth indication information and the first request information are carried in same information and sent to the first

terminal device, after receiving the information, the first terminal device may determine to start reverse TXOP sharing (starting from the third TXS time), and determine to stop transmitting the uplink data within the third TXS time. If the fourth indication information is carried in the first request information and sent to the first terminal device, after receiving the first request message, the first terminal device may also determine to start reverse TXOP sharing (starting from the third TXS time), and determine to stop transmitting the uplink data within the third TXS time.

[00185] After the access point device sends the first request message to the first terminal device, the access point device may further send second request information to the second terminal device within the third TXS time. Correspondingly, the second terminal device receives the second request information sent by the access point device. The second request information is used to request the second terminal device to report whether there is to-be-transmitted first uplink data. For example, the second request information may be carried in a null data physical protocol data unit feedback report poll (NDP feedback report poll, NFRP) frame sent by the access point device to the second terminal device.

[00186] In this embodiment of this application, there may be one or more second terminal devices. When there are a plurality of second terminal devices, the access point device may send, to each second terminal device, the second request information that is used to request each second terminal device to report whether there is to-be-transmitted first uplink data. After receiving the second request information, the second terminal device may report, to the access point device, whether there is the to-be-transmitted first uplink data.

[00187] When the second terminal device has the to-be-transmitted first uplink data, the second terminal device sends first indication information to the access point device. Correspondingly, the access point device receives the first indication information sent by the second terminal device. When it is determined that the second terminal device has no to-be-transmitted first uplink data to send the first indication information, the access point device is not notified. Alternatively, when the second terminal device has the to-be-transmitted first uplink data, the second terminal device sends the first indication information to the access point device. Correspondingly, the access point device receives the first indication information sent by the second terminal device. When the second terminal device has no to-be-transmitted first uplink data, the second terminal device sends third indication information to the access point device. Correspondingly, the access point device receives the third indication information sent by the second terminal device.

[00188] For example, the first indication information may be carried in an NFR frame sent by the second terminal device to the access point device. Alternatively, the third indication information may be carried in an NFR frame sent by the second terminal device to the access point device.

[00189] After the access point device receives the first indication information, the access point device determines that the second terminal device has the to-be-transmitted first uplink data. The access point device may send second indication information to the second terminal device. Correspondingly, the second terminal device receives the second indication information sent by the access point device. The second indication information indicates the second terminal device to send the first uplink data within the first TXS time. For example, the access point device may send a Trigger frame to the second terminal device, and schedule, by using the Trigger frame, the second terminal device to perform uplink transmission.

[00190] After receiving the second indication information, the second terminal device may send the first uplink data to the access point device. For example, the second terminal device sends an uplink PPDU frame to the access point device, and the uplink PPDU frame may carry the first uplink data. After receiving the first uplink data sent by the second terminal device, the access point device sends fifth indication information to the first terminal device, where the fifth indication information indicates that the first TXS time ends.

[00191] Optionally, the fifth indication information is carried in a second BlockAck frame sent by the access point device to the first terminal device. For example, a Reserved field in the second BlockAck frame may carry the fifth indication information. A 1-bit Reserved subfield in a Control field in the second BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 0, it indicates that the first TXS time ends.

[00192] Because the current TXOP holder is the first terminal device, after the access point device schedules the second terminal device to perform uplink transmission, the access point device is used to indicate that the first TXS time ends, and the first terminal device may continue to perform data transmission. Therefore, when the second terminal device has low latency traffic data, the second terminal device may perform uplink transmission within the first TXS time in the TXOP of the first terminal device, to improve traffic reliability of the second terminal device. In addition, after the second terminal device transmits the low latency traffic data, the first terminal device continues to transmit data within remaining time in the TXOP, so that normal running of a traffic of the first terminal device can also be ensured.

[00193] The following uses FIG. 6 as an example to describe a procedure in which the first terminal device shares the TXOP.

[00194] In FIG. 6, an example in which the first terminal device is an STA 1, and the two second terminal devices are an STA 2 and an STA 3 is used for description.

[00195] In the TXOP of the STA 1, the STA 1 sends an RTS frame that may be used to request to transmit uplink data. After receiving the RTS frame sent by the STA 1, an AP (access point device) sends a CTS frame to the STA 1. After receiving the CTS frame, the STA 1 may perform

uplink transmission, for example, send an uplink PPDU frame to the AP. The AP sends a first BlockAck frame (which may be, for example, a BA w frame or a Preq (preemption request) frame) to the STA 1, where the first BlockAck frame may carry first request information that is used to request the second TXS time (the TXS time includes the first TXS time and the third TXS time). For example, the AP sends, to the STA 1 at a specified time interval (or a specified quantity of PPDUs) after receiving the RTS frame or sending the CTS frame, the first BlockAck frame that carries the first request information.

[00196] After transmitting the first BlockAck frame, the AP transmits an NFRP frame after an interval of a SIFS (short interframe space). The NFRP frame may include second request information that is used to request the STA 2 and the STA 3 to report whether there is to-be-transmitted first uplink data.

[00197] After receiving the NFRP frame, the STA 2 transmits the NFR frame after the interval of the SIFS. If the STA 2 has the to-be-transmitted first uplink data, the NFR frame includes the first indication information. After receiving the NFRP frame, the STA 3 transmits the NFR frame after the interval of the SIFS. If the STA 3 has the to-be-transmitted first uplink data, the NFR frame includes the first indication information.

[00198] A period of time from a time point at which the AP transmits the first BlockAck frame to a time point at which the AP receives the NFR frames transmitted by the STA 2 and the STA 3 may be the second TXS time.

[00199] The AP receives the NFR frames transmitted by the STA 2 and the STA 3, and determines that the STA 2 and the STA 3 have the to-be-transmitted first uplink data. Within the first TXS time, the AP transmits a Trigger frame indicating the STA 2 and the STA 3 to transmit the first uplink data. The STA 2 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 2. The STA 3 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 3.

[00200] After receiving the first uplink data of the STA 2 and the first uplink data of the STA 3, the AP may transmit a second BlockAck frame, where the second BlockAck frame carries fifth indication information indicating that end time of the first TXS ends. Correspondingly, after receiving the second BlockAck frame, the STA 1 continues to transmit the second uplink data.

[00201] Embodiment 4:

[00202] When a TXOP holder is a first terminal device, an access point device may send first request information to the first terminal device. Correspondingly, the first terminal device receives the first request information sent by the access point device, where the first request information is used to request TXS time in the TXOP.

[00203] Optionally, when the access point device generates to-be-sent downlink data in the

TXOP, the access point device may send the first request information to the first terminal device. For example, after generating the to-be-sent downlink data, the access point device sends a first BlockAck frame to the first terminal device, where the first BlockAck frame may carry the first request information.

[00204] In this embodiment, the access point device may periodically send the first BlockAck frame to the first terminal device. The first BlockAck frame may carry the first request information that is used to request second TXS time. For example, a Reserved field in the first BlockAck frame may carry the first request information. A 1-bit Reserved subfield in a Control field in the first BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 1, it indicates that the second TXS time is requested.

[00205] After receiving the first request information, the first terminal device may determine to start reverse TXOP sharing. For example, a time point at which the first terminal device receives the first request information may be used as a start time of the second TXS time, or a time point at which the access point device sends the first request information to the first terminal device may be used as a start time of the second TXS time.

[00206] Optionally, the second TXS time in this embodiment of this application includes first TXS time and third TXS time, and the third TXS time is earlier than the first TXS time. Within the third TXS time, the access point device may request and obtain whether a second terminal device has to-be-transmitted first uplink data. Within the first TXS time, when the second terminal device has to-be-transmitted first uplink data, the access point device may schedule the second terminal device to perform uplink transmission.

[00207] The first terminal device suspends sending second uplink data to the access point device within the first TXS time. The first terminal device may also transmit the second uplink data within the first TXS time. For example, when the first terminal device buffers LLT data, the first terminal device may transmit the LLT data within the first TXS time. To avoid a resource conflict, the first terminal device and the second terminal device need to transmit the uplink data in different time domain resources within the first TXS time.

[00208] Optionally, the access point device may send fourth indication information to the first terminal device, where the fourth indication information indicates the first terminal device to stop sending second uplink data within the third TXS time. Correspondingly, the first terminal device receives the fourth indication information sent by the access point device.

[00209] For a relationship between the fourth indication information and the first request message, refer to the descriptions in Embodiment 3. Details are not described herein again.

[00210] After the access point device sends the first request message to the first terminal device, the access point device may further send second request information to the second terminal device

within the third TXS time. Correspondingly, the second terminal device receives the second request information sent by the access point device. The second request information is used to request the second terminal device to report whether there is to-be-transmitted first uplink data.

[00211] Because the access point device generates the to-be-sent downlink data, the access point device sends the downlink data within the second TXS time. For example, the access point device transmits a downlink PPDU frame, where the downlink PPDU frame may carry the downlink data and the second request information.

[00212] In this embodiment of this application, there may be one or more second terminal devices. When there are a plurality of second terminal devices, the access point device may send, to each second terminal device, the second request information that is used to request each second terminal device to report whether there is to-be-transmitted first uplink data.

[00213] For example, the second request information may be a Trigger frame or a management frame included in an aggregated medium access control (medium access control, MAC) protocol data unit (aggregate MAC protocol data unit, A-MPDU) of the downlink PPDU frame.

[00214] When a shared terminal group in which the first terminal device is located includes a plurality of second terminal devices, if the to-be-sent downlink data generated by the access point device is downlink data sent to a part of second terminal devices, to avoid a case in which another second terminal device cannot receive the second request information, in this embodiment of this application, the access point device allocates, in the downlink PPDU frame, a small quantity of resource units (resource unit, RU) to another second terminal device, to transmit second request information (for example, a Trigger frame or a management frame) sent to the another second terminal device. In this way, another second terminal device may also receive the downlink PPDU frame, and obtain the second request information. For example, the shared terminal group includes an STA 1, an STA 2, and an STA 3, and the STA 1 is the first terminal device. If the to-be-sent downlink data generated by the access point device is for the STA 2, a small quantity of RUs are allocated to the STA 3 in the downlink PPDU frame sent by the access point device, to transmit the second request information sent to the STA 3.

[00215] After receiving the second request information, the second terminal device may report, to the access point device, whether there is the to-be-transmitted first uplink data.

[00216] When the second terminal device has the to-be-transmitted first uplink data, the second terminal device sends first indication information to the access point device. Correspondingly, the access point device receives the first indication information sent by the second terminal device. When it is determined that the second terminal device has no to-be-transmitted first uplink data to send the first indication information, the access point device is not notified. Alternatively, when the second terminal device has the to-be-transmitted first uplink data, the second terminal device

sends the first indication information to the access point device. Correspondingly, the access point device receives the first indication information sent by the second terminal device. When the second terminal device has no to-be-transmitted first uplink data, the second terminal device sends third indication information to the access point device. Correspondingly, the access point device receives the third indication information sent by the second terminal device.

[00217] For example, the first indication information may be carried in an acknowledgment frame or a response frame sent by the second terminal device to the access point device. Alternatively, the third indication information may be carried in an acknowledgment frame or a response frame sent by the second terminal device to the access point device. That the acknowledgment frame or the response frame corresponds to the downlink PPDU frame transmitted by the access point device may be understood as that the acknowledgment frame or the response frame is used to notify the access point device that the second terminal device receives the downlink PPDU.

[00218] For the foregoing case in which the to-be-sent downlink data generated by the access point device is downlink data sent to a part of second terminal devices in the shared terminal group, after receiving the downlink PPDU frame, the part of second terminal devices may send an acknowledgment frame or a response frame to the access point device; and after receiving the second request information, another second terminal device reports, to the access point device, whether there is the to-be-transmitted first uplink data. For example, the shared terminal group includes an STA 1, an STA 2, and an STA 3, and the STA 1 is the first terminal device. If the to-be-sent downlink data generated by the access point device is for the STA 2, a small quantity of RUs are allocated to the STA 3 in the downlink PPDU frame sent by the access point device, to transmit the second request information sent to the STA 3. After receiving the downlink PPDU frame and obtaining the second request information, the STA 2 sends an acknowledgment frame or a response frame to the access point device. After receiving the second request information, the STA 3 sends the first indication information on the specified RU.

[00219] After the access point device receives the first indication information, the access point device determines that the second terminal device has the to-be-transmitted first uplink data. The access point device may send second indication information to the second terminal device. Correspondingly, the second terminal device receives the second indication information sent by the access point device. The second indication information indicates the second terminal device to send the first uplink data within the first TXS time.

[00220] For example, the access point device may send a Trigger frame to the second terminal device, and schedule, by using the Trigger frame, the second terminal device to perform uplink transmission.

[00221] After receiving the second indication information, the second terminal device may send the first uplink data to the access point device. For example, the second terminal device sends an uplink PPDU frame to the access point device, and the uplink PPDU frame may carry the first uplink data.

[00222] After receiving the first uplink data sent by the second terminal device, the access point device may send fifth indication information to the first terminal device, where the fifth indication information indicates that the first TXS time ends. Optionally, the fifth indication information is carried in a second BlockAck frame sent by the access point device to the first terminal device. For example, a Reserved field in the second BlockAck frame may carry fifth indication information. A 1-bit Reserved subfield in a Control field in the second BlockAck frame is specified as a Preemption Request subfield. When the Preemption Request subfield is set to 0, it indicates that the first TXS time ends.

[00223] Because the current TXOP holder is the first terminal device, after the access point device schedules the second terminal device to perform uplink transmission, the access point device is used to indicate that the first TXS time ends, and the first terminal device may continue to perform data transmission. Therefore, when the second terminal device has low latency traffic data, the second terminal device may perform uplink transmission within the first TXS time in the TXOP of the first terminal device, to improve traffic reliability of the second terminal device. In addition, after the second terminal device transmits the low latency traffic data, the first terminal device continues to transmit data within remaining time in the TXOP, so that normal running of a traffic of the first terminal device can also be ensured.

[00224] The following uses FIG. 7 as an example to describe a procedure in which the first terminal device shares the TXOP.

[00225] In FIG. 7, an example in which the first terminal device is an STA 1, and the two second terminal devices are an STA 2 and an STA 3 is used for description.

[00226] In the TXOP of the STA 1, the STA 1 sends an RTS frame that may be used to request to transmit uplink data. After receiving the RTS frame sent by the STA 1, an AP sends a CTS frame to the STA 1. After receiving the CTS frame, the STA 1 may perform uplink transmission, for example, send an uplink PPDU frame to the AP. If the AP generates to-be-sent downlink data, after receiving an uplink PPDU frame sent by the STA 1, the AP sends a first BlockAck frame (which may be, for example, a BA w frame or a Preq (preemption request) frame) to the STA 1 after an interval of a SIFS. The first BlockAck frame may carry the first request information that is used to request the second TXS time (the TXS time includes the first TXS time and the third TXS time).

[00227] After transmitting the first BlockAck frame, the AP transmits a downlink PPDU frame after the interval of the SIFS. The downlink PPDU frame may carry the downlink data and the

second request information. For example, if the downlink data generated by the AP is data for the STA 2 and the STA 3, the A-MPDU of the downlink PPDU frame may include a Trigger frame or a management frame, to request the STA 2 and the STA 3 to report whether there is to-be-transmitted uplink data.

[00228] After receiving the downlink PPDU frame, the STA 2 sends an acknowledgment frame (or a response frame) to the AP after the interval of the SIFS. If the STA 2 has to-be-transmitted first uplink data, the acknowledgment frame (or the response frame) includes the first indication information. After receiving the downlink PPDU frame, the STA 3 sends an acknowledgment frame (or a response frame) to the AP after the interval of the SIFS. If the STA 3 has to-be-transmitted first uplink data, the acknowledgment frame (or the response frame) includes the first indication information.

[00229] The AP receives acknowledgment frames (or response frames) transmitted by the STA 2 and the STA 3, and determines that the STA 2 and the STA 3 have the to-be-transmitted first uplink data. Within the first TXS time, the AP transmits a Trigger frame indicating the STA 2 and the STA 3 to transmit the first uplink data. The STA 2 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 2. The STA 3 transmits an uplink PPDU frame to the AP, where the uplink PPDU frame may carry first uplink data of the STA 3.

[00230] After receiving the first uplink data of the STA 2 and the first uplink data of the STA 3, the AP may transmit a second BlockAck frame, where the second BlockAck frame carries fifth indication information indicating that end time of the first TXS ends. Correspondingly, after receiving the second BlockAck frame, the STA 1 continues to transmit the second uplink data.

[00231] Based on the foregoing communication method provided in this embodiment of this application, in the TXOP of the first terminal device, the access point device may send the first request information to the first terminal device, to request the TXS time, so that the first terminal device may determine, based on the first request information, an occasion for sharing the TXOP. In addition, within the TXS time, the second terminal device may send, to the access point device, first indication information indicating that there is to-be-transmitted uplink data, so that the access point device may determine, based on the first indication information sent by the second terminal device, that the second terminal device needs to be scheduled. For example, when the access point device determines that the second terminal device has to-be-transmitted uplink data, the access point device may schedule, within the TXS time, the second terminal device to transmit the uplink data.

[00232] FIG. 8 is a diagram of a structure of a communication apparatus according to an embodiment of this application. Refer to FIG. 8. The communication apparatus may be configured

to perform a process performed by the access point device in any one of the foregoing embodiments, or the communication apparatus may be configured to perform a process performed by the first terminal device or the second terminal device in any one of the foregoing embodiments. For details, refer to related descriptions in the foregoing method embodiments.

[00233] The communication apparatus 800 includes a communication unit 801 and a processing unit 802. The processing unit 802 is configured to perform data processing. The communication unit 801 may implement a corresponding communication function. The communication unit 801 may also be referred to as a communication interface, a communication module, a transceiver unit, or a transceiver module. Optionally, the communication apparatus 800 may further include a storage unit 803. The storage unit 803 may be configured to store a computer program and/or instructions and/or data. The processing unit 802 may read the computer program and/or instructions and/or data in the storage unit 803, so that the communication apparatus 800 implements the foregoing method embodiments.

[00234] The communication apparatus 800 may be an apparatus on the access point device side in the foregoing embodiments, for example, the access point device, a communication module in the access point device, or a circuit or a chip responsible for a communication function in the access point device. The processing unit 802 is configured to perform a processing-related operation on the access point device side in the foregoing method embodiments. The communication unit 801 is configured to perform a sending/receiving-related operation on the access point device side in the foregoing method embodiments.

[00235] Alternatively, the communication apparatus 800 may be an apparatus on the second terminal device side in the foregoing embodiments, for example, the second terminal device, a communication module in the second terminal device, or a circuit or a chip responsible for a communication function in the second terminal device. The processing unit 802 is configured to perform a processing-related operation on the second terminal device side in the foregoing method embodiments. The communication unit 801 is configured to perform a sending/receiving-related operation on the second terminal device side in the foregoing method embodiments.

[00236] Alternatively, the communication apparatus 800 may be an apparatus on the first terminal device side in the foregoing embodiments, for example, the first terminal device, a communication module in the first terminal device, or a circuit or a chip responsible for a communication function in the first terminal device. The processing unit 802 is configured to perform a processing-related operation on the first terminal device side in the foregoing method embodiments. The communication unit 801 is configured to perform a sending/receiving-related operation on the first terminal device side in the foregoing method embodiments.

[00237] Optionally, the communication unit 801 may include a sending unit and a receiving

unit. The sending unit is configured to perform a sending operation in the foregoing method embodiments. The receiving unit is configured to perform a receiving operation in the foregoing method embodiments.

[00238] It should be noted that the communication unit 801 may include a sending unit, but does not include a receiving unit. Alternatively, the communication apparatus 800 may include the receiving unit, but does not include the sending unit. This may be specifically determined depending on whether the foregoing solution performed by the communication apparatus 800 includes a sending action and a receiving action.

[00239] It should be understood that a specific process in which the modules perform the foregoing corresponding process has been described in detail in the foregoing method embodiments. For brevity, details are not described herein again.

[00240] In a possible design, when the communication apparatus 800 is the access point device or a communication module in the access point device, a function of the processing unit 802 may be implemented by one or more processors. Specifically, the processor may include a modem chip, or a system on chip SoC chip or a SIP chip that includes a modem core. A function of the communication unit 801 may be implemented by a transceiver circuit. In another possible design, when the communication apparatus 800 is a circuit, a chip, or a chip system responsible for a communication function in the access point device, a function of the processing unit 802 may be implemented by a circuit system that is in the chip and that includes one or more processors or processor cores. A function of the communication unit 801 may be implemented by the interface circuit or the data transceiver circuit on the chip.

[00241] In a possible design, when the communication apparatus 800 is the second terminal device or a communication module in the second terminal device, or the communication apparatus 800 is the first terminal device or a communication module in the first terminal device, a function of the processing unit 802 may be implemented by one or more processors. Specifically, the processor may include a modem chip, or a system on chip SoC chip or a SIP chip that includes a modem core. A function of the communication unit 801 may be implemented by a transceiver circuit. In another possible design, when the communication apparatus 800 is a circuit or a chip responsible for a communication function in the second terminal device, or the communication apparatus 800 is a circuit or a chip responsible for a communication function in the first terminal device, for example, a modem chip, a system-on-a-chip SoC chip including a modem core, or a SIP chip, a function of the processing unit 802 may be implemented by a circuit system that includes one or more processors or processor cores in the chip. A function of the communication unit 801 may be implemented by the interface circuit or the data transceiver circuit on the chip.

[00242] It may be understood that unit division in the foregoing apparatus is merely logical

function division. Each function may correspond to one functional unit, or two or more functions may be integrated into one functional unit. During actual implementation, all or a part of units may be integrated into one physical entity, or may be distributed on different physical entities. In addition, the foregoing functional units may be implemented in a form of hardware, or may be implemented in a form of software, or may be implemented in a form of hardware in combination with software. Whether a function is performed by hardware or software depends on particular applications and design constraint conditions of the technical solutions. A person skilled in the art may use a different method for each particular application to implement the described functions, but it should not be considered that the implementation goes beyond the scope of this application.

[00243] In an example, a functional unit in any one of the foregoing apparatuses may be configured as one or more integrated circuits for implementing the foregoing methods, for example, one or more application-specific integrated circuits (application-specific integrated circuit, ASIC), one or more central processing units (central processing unit, CPU), one or more microcontroller units (Microcontroller Unit, MCU), one or more digital signal processors (digital signal processor, DSP), one or more field programmable gate arrays (field programmable gate array, FPGA), or a combination of at least two of these integrated circuit forms.

[00244] In an example, the storage unit 803 may include a random access memory, a flash memory, a read-only memory, a programmable read-only memory, an electrically erasable programmable memory, a register, and/or the like.

[00245] This application further provides a communication apparatus 900. As shown in FIG. 9, the communication apparatus 900 may be an access point device or a chip in an access point device, or the communication apparatus 900 may be a second terminal device or a chip in a second terminal device, or the communication apparatus 900 may be a first terminal device or a chip in the first terminal device. The communication apparatus 900 includes a processor 901 and a communication interface 902, and optionally, may further include a memory 903.

[00246] The processor 901 may be a CPU, a digital processing unit, or the like. The communication interface 902 may be a transceiver, an interface circuit like a transceiver circuit, a transceiver chip, or the like. The apparatus further includes a memory 903, configured to store a program executed by the processor 901. The memory 903 may be a non-volatile memory, for example, a hard disk (hard disk drive, HDD) or a solid-state drive (solid-state drive, SSD), or may be a volatile memory (volatile memory), for example, a random-access memory (random-access memory, RAM). The memory 903 is any other medium that can be configured to carry or store expected program code in a form of instructions or a data structure and that can be accessed by a computer, but is not limited thereto.

[00247] The processor 901 is configured to execute the program code stored in the memory 903,

and is specifically configured to perform an action of the processing unit 802. The communication interface 902 is specifically configured to perform an action of the communication unit 801. Details are not described herein again in this application.

[00248] A specific connection medium between the communication interface 902, the processor 901, and the memory 903 is not limited in embodiments of this application. In this embodiment of this application, the memory 903, the processor 901, and the communication interface 902 are connected through a bus 904 in FIG. 9, and the bus is represented by a thick line in FIG. 9. A connection manner between other components is merely schematically described, 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 thick line is used to represent the bus in FIG. 9, but this does not mean that there is only one bus or only one type of bus.

[00249] An embodiment of this application further provides a computer-readable storage medium. The computer-readable storage medium stores a computer program or instructions used to implement the method performed by the access point device, the second terminal device, or the first terminal device in the foregoing method embodiments.

[00250] For example, when the computer program or the instructions are executed by a computer, the computer is enabled to implement the method performed by the access point device, the second terminal device, or the first terminal device in the foregoing method embodiments.

[00251] An embodiment of this application further provides a computer program product including a computer program or instructions. When the instructions are executed by a computer, the computer is enabled to implement the method performed by the access point device, the second terminal device, or the first terminal device in the foregoing method embodiments.

[00252] An embodiment of this application further provides a communication system. The communication system includes the access point device in the foregoing embodiments, the second terminal device in the foregoing embodiments, and the first terminal device in the foregoing embodiments.

[00253] An embodiment of this application further provides a chip apparatus, including a processor, configured to invoke a computer program or computer instructions stored in a memory, so that the processor performs the method according to any one of the foregoing embodiments.

[00254] In a possible implementation, an input of the chip apparatus corresponds to the receiving operation in any one of the foregoing embodiments, and an output of the chip apparatus corresponds to the sending operation in any one of the foregoing embodiments.

[00255] Optionally, the processor is coupled to the memory through an interface.

[00256] Optionally, the chip apparatus further includes a memory, and the memory stores a computer program or instructions.

[00257] The processor mentioned in any of the foregoing may be a general-purpose central processing unit, a microprocessor, an application-specific integrated circuit (application-specific integrated circuit, ASIC), or one or more integrated circuits configured to control program execution of the method according to any one of the foregoing embodiments. The memory mentioned in any one of the foregoing may be a read-only memory (read-only memory, ROM), another type of static storage device that can store static information and instructions, a random access memory (random access memory, RAM), or the like.

[00258] It may be clearly understood by a person skilled in the art that for convenient and brief description, for explanations and beneficial effect of related content in any one of the communication apparatuses provided above, refer to the corresponding method embodiments provided above. Details are not described herein again.

[00259] In the several embodiments provided in this application, it should be understood that the disclosed system, apparatus, and method may be implemented in other manners. For example, the described apparatus embodiments are merely examples. For example, division into the units is merely logical function division and may be other division during actual implementation. For example, a plurality of units or components may be combined or integrated into another system, or some features may be ignored or not performed. In addition, the displayed or discussed mutual couplings or direct couplings or communication connections may be implemented through some interfaces. The indirect couplings or communication connections between the apparatuses or units may be implemented in electronic, mechanical, or another form.

[00260] The units described as separate components may or may not be physically separate, and components displayed as units may or may not be physical units, may be located in one position, or may be distributed on a plurality of network units. A part or all of the units may be selected based on an actual requirement to achieve the objectives of the solutions of embodiments.

[00261] In addition, functional units in embodiments of this application may be integrated into one processing unit, each of the units may exist alone physically, or two or more units may be integrated into one unit. The integrated unit may be implemented in a form of hardware, or may be implemented in a form of a software functional unit.

[00262] When the integrated unit is implemented in the form of the software functional unit and sold or used as an independent product, the integrated unit may be stored in a computer-readable storage medium. Based on such an understanding, the part essentially contributing to the technical solutions of this application or all or some of the technical solutions may be implemented in a form of a software product. The computer software product is stored in a storage medium and includes a plurality of instructions for instructing a computer device (which may be a personal computer, a server, a network device, or the like) to perform all or some of the steps of the methods in

embodiments of this application. The foregoing storage medium includes any medium that can store program code, for example, a USB flash drive, a removable hard disk, a ROM, a RAM, a magnetic disk, or an optical disc.

[00263] In conclusion, the foregoing embodiments are only intended for describing the technical solutions of this application, but not for limiting this application. Although this application is described in detail with reference to the foregoing embodiments, a person of ordinary skill in the art should understand that they may still make modifications to the technical solutions described in the foregoing embodiments or make equivalent replacements to some technical features thereof, without departing from the scope of the technical solutions of embodiments of this application.

CLAIMS

1. A communication method, applied to an access point device, wherein the method comprises:

when a transmit opportunity TXOP holder is a first terminal device, receiving first indication information, wherein the first indication information indicates that a second terminal device has to-be-transmitted first uplink data; and

sending second indication information to the second terminal device, wherein the second indication information indicates the second terminal device to send the first uplink data within first TXOP sharing TXS time, and the first TXS time is a resource in the TXOP.

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

sending a first request message to the first terminal device, wherein the first request message is used to request the first TXS time in the TXOP.

3. The method according to claim 1 or 2, wherein receiving the first indication information comprises:

receiving, in a first frequency domain resource, the first indication information sent by the second terminal device, wherein the first frequency domain resource is a part of frequency domain resources within a transmission bandwidth of the first terminal device, or the first frequency domain resource is a frequency domain resource outside the transmission bandwidth of the first terminal device.

4. The method according to claim 3, wherein the first frequency domain resource comprises a plurality of tone sets corresponding to the second terminal device, and the plurality of tone sets comprise a first tone set and a second tone set; and

the first tone set is used to transmit the first indication information, the second tone set is used to transmit third indication information sent by the second terminal device to the access point device, and the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

5. The method according to claim 1 or 2, wherein receiving the first indication information comprises:

receiving the first indication information sent by the first terminal device, wherein the first indication information is associated with a traffic indication frame sent by the second terminal device to the first terminal device, and the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data.

6. The method according to claim 5, wherein the first indication information is carried in an uplink physical protocol data unit PPDU frame.

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

sending a first request message to the first terminal device, wherein the first request message is used to request second TXS time in the TXOP, and the second TXS time comprises the first TXS time.

8. The method according to claim 7, wherein the second TXS time further comprises third TXS time, and the third TXS time is earlier than the first TXS time; and

the method further comprises:

sending second request information to the second terminal device within the third TXS time, wherein the second request information is used to request the second terminal device to report whether there is the to-be-transmitted first uplink data.

9. The method according to claim 8, wherein the method further comprises:

sending fourth indication information to the first terminal device, wherein the fourth indication information indicates the first terminal device to stop sending second uplink data within the third TXS time.

10. The method according to claim 8, wherein the second request message is carried in a null data physical protocol data unit feedback report poll NFRP frame, and the first indication information is carried in a null data physical protocol data unit feedback report NFR frame.

11. The method according to claim 8, wherein sending the second request message to the first terminal device comprises:

sending a downlink PPDU frame to the second terminal device, wherein the downlink PPDU frame is used to carry to-be-sent downlink data and the second request message.

12. The method according to claim 11, wherein the first indication information is carried in an acknowledgment frame or a response frame, and the acknowledgment frame or the response frame corresponds to the downlink PPDU frame.

13. The method according to any one of claims 7 to 12, wherein the method further comprises:

receiving third indication information, wherein the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data; and

sending fifth indication information to the first terminal device, wherein the fifth indication information indicates that the TXS time ends.

14. The method according to any one of claims 1 to 12, wherein the method further comprises:

receiving, within the first TXS time, the first uplink data sent by the second terminal device; and

sending fifth indication information to the first terminal device, wherein the fifth indication information indicates that the TXS time ends.

15. The method according to any one of claims 1 to 14, wherein the to-be-transmitted first uplink data is low latency traffic LLT data.

16. The method according to any one of claims 1 to 15, wherein the method further comprises:

sending sixth indication information to the first terminal device, wherein the sixth indication information indicates the first terminal device not to transmit uplink data within the first TXS time; or

sending seventh indication information to the first terminal device, wherein the seventh indication information indicates the first terminal device to transmit low latency traffic data within the first TXS time.

17. The method according to any one of claims 1 to 16, wherein the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

18. A communication method, applied to a second terminal device, wherein the method comprises:

when a transmit opportunity TXOP holder is a first terminal device, receiving second indication information sent by an access point device, wherein the second indication information indicates to send first uplink data within first TXOP sharing TXS time, and the first TXS time is a resource in the TXOP; and

sending the first uplink data within the first TXS time.

19. The method according to claim 18, wherein the method further comprises:

sending first indication information to the access point device in a first frequency domain resource, wherein the first indication information indicates that the second terminal device has the to-be-transmitted first uplink data; and the first frequency domain resource is a part of frequency domain resources within a transmission bandwidth of the first terminal device, or the first frequency domain resource is a frequency domain resource outside the transmission bandwidth of the first terminal device.

20. The method according to claim 19, wherein the first frequency domain resource comprises a plurality of tone sets corresponding to the second terminal device, and the plurality of tone sets comprise a first tone set and a second tone set; and

the first tone set is used to transmit the first indication information, the second tone set is used to transmit third indication information sent by the second terminal device to the access point device, and the third indication information indicates that the second terminal device has no to-be-transmitted first uplink data.

21. The method according to claim 18, wherein the method further comprises:

sending a traffic indication frame to the first terminal device, wherein the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data.

22. The method according to claim 18, wherein the method further comprises:

sending first indication information to the access point device, wherein the first indication

information indicates that the second terminal device has the to-be-transmitted first uplink data.

23. The method according to claim 22, wherein the method further comprises:

receiving, within third TXS time, a second request message sent by the access point device, wherein the second request message is used to request the second terminal device to report whether there is the to-be-transmitted first uplink data, and the third TXS time is earlier than the first TXS time.

24. The method according to claim 23, wherein the second request message is carried in an NFRP frame, and the first indication information is carried in an NFR frame.

25. The method according to claim 23, wherein receiving the second request message sent by the access point device comprises:

receiving a downlink PPDU frame sent by the access point device, wherein the downlink PPDU frame is used to carry downlink data generated by the access point device and the second request message.

26. The method according to claim 25, wherein the first indication information is carried in an acknowledgment frame or a response frame, and the acknowledgment frame or the response frame corresponds to the downlink PPDU frame.

27. The method according to any one of claims 18 to 26, wherein the to-be-transmitted first uplink data is LLT data.

28. The method according to any one of claims 18 to 27, wherein the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

29. A communication method, applied to a first terminal device, wherein the method comprises:

when a transmit opportunity TXOP holder is the first terminal device, receiving first request information, wherein the first request information is used to request first TXS time in the TXOP, and the first TXS time is used by a second terminal device to send first uplink data; and

sending second uplink data to an access point device in a resource in the TXOP.

30. The method according to claim 29, wherein receiving the first request information comprises:

receiving the first request information sent by the access point device.

31. The method according to claim 30, wherein the method further comprises:

receiving a traffic indication frame sent by the second terminal device, wherein the traffic indication frame indicates that the second terminal device has the to-be-transmitted first uplink data; and

sending first indication information to the access point device, wherein the first indication information indicates that the second terminal device has the to-be-transmitted first uplink data.

32. The method according to claim 31, wherein the first indication information is carried in an uplink PPDU frame.

33. The method according to any one of claims 29 to 32, wherein the method further comprises:

receiving fifth indication information sent by the access point device, wherein the fifth indication information indicates that the TXS time ends.

34. The method according to any one of claims 29 to 33, wherein the first uplink data is LLT data.

35. The method according to any one of claims 29 to 34, wherein the first terminal device and the second terminal device are terminal devices in a same TXOP sharing terminal group.

36. A communication apparatus, comprising a module or unit configured to perform the method according to any one of claims 1 to 17, or comprising a module or unit configured to perform the method according to any one of claims 18 to 28, or comprising a module or unit configured to perform the method according to any one of claims 29 to 35.

37. A communication apparatus, comprising one or more processors, wherein the one or more processors are configured to execute a computer program in a memory, to enable the communication apparatus to perform the method according to any one of claims 1 to 17, or to enable the communication apparatus to perform the method according to any one of claims 18 to 28, or to enable the communication apparatus to perform the method according to any one of claims 29 to 35.

38. A computer-readable storage medium, wherein the storage medium stores a computer program or instructions, and when the computer program or the instructions are executed by a computer, the method according to any one of claims 1 to 17, or the method according to any one of claims 18 to 28, or the method according to any one of claims 29 to 35 is implemented.

39. A computer program product, wherein when a computer reads and executes the computer program product, the computer is enabled to perform the method according to any one of claims 1 to 17, the method according to any one of claims 18 to 28, or the method according to any one of claims 29 to 35.