

METHOD, APPARATUS, AND SYSTEM FOR TRANSMITTING TRAFFIC INDICATION MESSAGE

~~CROSS-REFERENCE TO RELATED APPLICATIONS~~

~~— This application claims priority to Chinese Patent Application No. 201210008652.0,
filed with the Chinese Patent Office on January 11, 2012, which is incorporated herein by reference
in its entirety.~~

TECHNICAL FIELD

The present invention relates to a WiFi (Wireless Fidelity, wireless fidelity) technology,
and in particular, to a method, an apparatus, and a system for transmitting a group traffic indication
message.

BACKGROUND

As a short-range wireless communications technology, the WiFi technology has gained
wide application in wireless local area network construction and wide area network access due to its
advantages such as convenient use and a high transmission rate. Nowadays, many public places
such as airport lounges and coffee shops are equipped with APs (Access Point, access point) for
WiFi.

In a WiFi wireless network, when a STA (Station, a terminal device supporting 802.11
protocols) accesses the network, the STA needs to establish association with an AP first, and the AP
assigns an AID (Association ID, association ID) to the STA. After that, the AP periodically
broadcasts a beacon (beacon) frame which includes a TIM (Traffic Indication Message, traffic
indication message), and the TIM carries identifiers which indicate whether all STAs associated
with the AP have data to deliver. The identifier is used to notify the STA of whether the STA has
data to receive. By periodically receiving a Beacon message, the STA obtains a value of a bit (bit)
corresponding to the AID of the STA in a bitmap (bitmap) of the TIM message, and thereby
determines whether the STA has data to receive; if the value is 1, it indicates that the STA has data
to receive; and if the value is 0, it indicates that the STA has no data to receive. If the STA has data

CLAIMS

1. A method for transmitting a traffic indication message, comprising:

compressing (101) a delivery traffic indication message, and generating a traffic indication message, wherein the delivery traffic indication message is used for indicating whether at least one terminal device associated with an access point has data to receive, and the delivery traffic indication message indicates, through a delivery traffic indication bit corresponding to the at least one terminal device, whether the at least one terminal device has data to receive; and

transmitting (102) the traffic indication message, wherein the traffic indication message comprises compression method indication information and the compressed delivery traffic indication message, and the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message.

2. The method according to claim 1, wherein the compressing the delivery traffic indication message specifically comprises encoding a bitmap of the delivery traffic indication bit.

3. The method according to claim 1 or 2, wherein the traffic indication message further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

4. The method according to any one of claims 1 to 3, wherein the compressing (101) the delivery traffic indication message and generating the traffic indication message specifically comprise:

grouping (301) all terminal devices associated with the access point according to a preset number, and obtaining at least one terminal device group;

compressing (302) the delivery traffic indication message corresponding to the at least one terminal device group, and generating (302) the traffic indication message corresponding to the at least one terminal device group, wherein the delivery traffic indication message is corresponding to one terminal device in the at least one terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message; and

the transmitting (102) the traffic indication message specifically comprises:

transmitting the traffic indication message corresponding to the at least one terminal device group, wherein the traffic indication message further comprises group information, the group information is group information used for indicating the terminal device group corresponding to the traffic indication message, and the delivery traffic indication message indicates, through a delivery

traffic indication bit corresponding to each terminal device in the terminal device group corresponding to the delivery traffic indication message, whether each terminal device in the terminal device group corresponding to the delivery traffic indication message has data to receive.

5. The method according to claim 4, wherein the transmitting the traffic indication message corresponding to the at least one terminal device group comprises:

sequentially transmitting (303) the traffic indication message corresponding to the at least one terminal device group; or

simultaneously transmitting the traffic indication message corresponding to the at least one terminal device group.

6. A method for receiving a traffic indication message, comprising:

receiving (201), by a first terminal device, a traffic indication message, wherein the traffic indication message comprises compression method indication information and a compressed delivery traffic indication message corresponding to at least one terminal device associated with an access point, the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message corresponding to the at least one terminal device, and the delivery traffic indication message indicates, through a delivery traffic indication bit, whether the at least one terminal device has data to receive; and

decompressing (202), according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message, and obtaining the delivery traffic indication bit corresponding to the first terminal device.

7. The method according to claim 6, wherein the decompressing (202), according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message specifically comprises decoding a bitmap of the delivery traffic indication bit.

8. The method according to claim 6 or 7, wherein the traffic indication message further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

9. The method according to any one of claims 6 to 8, wherein the traffic indication message further comprises group information of a terminal device group, the group information is group information used for indicating the terminal device group, the traffic indication message is corresponding to the terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message.

10. The method according to claim 9, wherein the decompressing (202), according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message comprises:

5 when the traffic indication message received by the first terminal device is a traffic indication message corresponding to one terminal device group, determining (304), according to the group information in the received traffic indication message, whether the received traffic indication message is the traffic indication message corresponding to the terminal device group to which the first terminal device belongs;

10 when it is determined that the traffic indication message received by the first terminal device is the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, decompressing (305), according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message; and

15 when it is determined, according to the group information in the received traffic indication message, that the received traffic indication message is not the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, continuing (306) to receive a traffic indication message corresponding to a next terminal device group; or predicting (306), according to the group information in the received traffic indication message, a
20 beacon frame of the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, and obtaining the beacon frame at the moment when the beacon frame is sent.

11. The method according to claim 9, wherein the decompressing (305), according to the compression method indicated by the compression method indication information in the received
25 traffic indication message, the delivery traffic indication message in the received traffic indication message comprises:

 when the traffic indication message received by the first terminal device is a traffic indication message corresponding to at least two terminal device groups, obtaining, according to the group information in the received traffic indication message, the delivery traffic indication message
30 corresponding to the terminal device group to which the first terminal device belongs; and decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message.

12. An access point (801), comprising:

a compressing unit (501), configured to compress a delivery traffic indication message and generate a traffic indication message, wherein the delivery traffic indication message is used for indicating whether at least one terminal device associated with the access point has data to receive, and the delivery traffic indication message indicates, through a delivery traffic indication bit
5 corresponding to the at least one terminal device, whether the at least one terminal device has data to receive; and

a transmitting unit (502), configured to transmit the traffic indication message, wherein the traffic indication message comprises compression method indication information and the compressed delivery traffic indication message, and the compression method indication information
10 is used for indicating a compression method adopted to compress the delivery traffic indication message.

13. The access point (801) according to claim 12, wherein the compressing unit (501) is specifically configured to encode a bitmap of the delivery traffic indication bit.

14. The access point (801) according to claim 12 or 13, wherein the traffic indication message
15 transmitted by the transmitting unit (502) further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

15. The access point (801) according to any one of claims 12 to 14, wherein
the compressing unit (501) comprises:

20 a grouping module, configured to group all terminal devices associated with the access point according to a preset number and obtain at least one terminal device group; and

a compressing module (61), configured to compress the delivery traffic indication message corresponding to the at least one terminal device group, and generate the traffic indication message corresponding to the at least one terminal device group, wherein the delivery traffic indication
25 message is corresponding to one terminal device in the at least one terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message; and

the transmitting unit (502) is specifically configured to transmit the traffic indication message corresponding to the at least one terminal device group, wherein the traffic indication message
30 further comprises group information, the group information is group information used for indicating the terminal device group corresponding to the traffic indication message, and the delivery traffic indication message indicates, through the delivery traffic indication bit corresponding to each terminal device in the terminal device group corresponding to the delivery traffic indication message, whether each terminal device in the terminal device group corresponding to the delivery

traffic indication message has data to receive.

16. The access point (801) according to claim 15, wherein the transmitting unit (502) is specifically configured to sequentially transmit the traffic indication message corresponding to the at least one terminal device group; or

5 the transmitting unit (502) is specifically configured to simultaneously transmit the traffic indication message corresponding to the at least one terminal device group.

17. A terminal device (802), comprising:

10 a receiving unit (701), configured to receive a traffic indication message, wherein the traffic indication message comprises compression method indication information and a compressed delivery traffic indication message corresponding to at least one terminal device associated with an access point, the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message corresponding to the at least one terminal device, and the delivery traffic indication message indicates, through a delivery traffic indication bit, whether the at least one terminal device has data to receive; and

15 a decompressing unit (702), configured to decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message, and obtain the delivery traffic indication bit corresponding to the terminal device.

20 18. The terminal device (802) according to claim 17, wherein the decompressing unit (702) is specifically configured to decode a bitmap of the delivery traffic indication bit.

19. The terminal device (802) according to claim 17 or 18, wherein the traffic indication message received by the receiving unit (701) further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

25 20. The terminal device (802) according to any one of claims 17 to 19, wherein the traffic indication message received by the receiving unit (701) further comprises group information of a terminal device group, the group information is group information used for indicating the terminal device group, the traffic indication message is corresponding to the terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message.

30 21. The terminal device (802) according to claim 20, wherein the decompressing unit (702) is specifically configured to:

when the traffic indication message received by the receiving unit (701) is a traffic indication message corresponding to one terminal device group, determine, according to the group information

in the received traffic indication message, whether the received traffic indication message is the traffic indication message corresponding to the terminal device group to which the terminal device belongs;

when it is determined that the traffic indication message received by the receiving unit (701) is the traffic indication message corresponding to the terminal device group to which the terminal device belongs, decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message; or

when it is determined, according to the group information in the received traffic indication message, that the traffic indication message received by the receiving unit (701) is not the traffic indication message corresponding to the terminal device group to which the terminal device belongs, continue to receive a traffic indication message corresponding to a next terminal device group; or predict, according to the group information in the received traffic indication message, a beacon frame of the traffic indication message corresponding to the terminal device group to which the terminal device belongs, and obtain the beacon frame at the moment when the beacon frame is sent.

22. The terminal device (802) according to claim 20, wherein the decompressing unit (702) is specifically configured to:

when the traffic indication message received by the receiving unit (701) is a traffic indication message corresponding to at least two terminal device groups, obtain, according to the group information in the received traffic indication message, the delivery traffic indication message corresponding to the terminal device group to which the terminal device belongs; and decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message.

23. A system for transmitting a traffic indication message, comprising the access point (801) according to claims 12 to 16 and the terminal device (802) according to claims 17 to 22.

CLAIMS:

1. A method for transmitting a traffic indication message, comprising:

compressing a delivery traffic indication message, and generating a traffic indication message, wherein the delivery traffic indication message is used for indicating whether at least one terminal device associated with an access point has data to receive, and the delivery traffic indication message indicates, through a delivery traffic indication bit corresponding to the at least one terminal device, whether the at least one terminal device has data to receive; and

transmitting the traffic indication message, wherein the traffic indication message comprises compression method indication information and the compressed delivery traffic indication message, and the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message.

2. The method according to any one of claim 1, wherein the compressing the delivery traffic indication message and generating the traffic indication message specifically comprise:

grouping all terminal devices associated with the access point according to a preset number, and obtaining at least one terminal device group;

compressing the delivery traffic indication message corresponding to the at least one terminal device group, and generating the traffic indication message corresponding to the at least one terminal device group, wherein the delivery traffic indication message is corresponding to one terminal device in the at least one terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message; and

the transmitting the traffic indication message specifically comprises:

transmitting the traffic indication message corresponding to the at least one terminal device group, wherein the traffic indication message further comprises group information, the group information is group information used for indicating the terminal device group corresponding to the traffic indication message, and the delivery traffic indication message indicates, through a delivery traffic indication bit corresponding to each terminal device in the terminal device group corresponding to the delivery traffic indication message, whether each terminal device in the terminal device group corresponding to the delivery traffic indication message has data to receive.

3. The method according to claim 1 or 2, wherein the compressing the delivery traffic indication message specifically comprises encoding a bitmap of the delivery traffic indication bit.

4. The method according to any one of claims 1 to 3, wherein the traffic indication message further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

5. The method according to any one of claims 1 to 4, wherein the transmitting the traffic indication message corresponding to the at least one terminal device group comprises:

sequentially transmitting the traffic indication message corresponding to the at least one terminal device group; or

simultaneously transmitting the traffic indication message corresponding to the at least one terminal device group.

6. A method for receiving a traffic indication message, comprising:

receiving, by a first terminal device, a traffic indication message, wherein the traffic indication message comprises compression method indication information and a compressed delivery traffic indication message corresponding to at least one terminal device associated with an access point, the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message corresponding to the at least one terminal device, and the delivery traffic indication message indicates, through a delivery traffic indication bit, whether the at least one terminal device has data to receive; and

decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message, and obtaining the delivery traffic indication bit corresponding to the first terminal device.

7. The method according to of claim 6, wherein the traffic indication message further comprises group information of a terminal device group, the group information is group information used for indicating the terminal device group, the traffic indication message is corresponding to the terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message.

8. The method according to claim 7, wherein the decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message comprises:

when the traffic indication message received by the first terminal device is a traffic indication message corresponding to one terminal device group, determining, according to the group information in the received traffic indication message, whether the received traffic indication message is the traffic indication message corresponding to the terminal device group to which the first terminal device belongs;

when it is determined that the traffic indication message received by the first terminal device is the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message; and

when it is determined, according to the group information in the received traffic indication message, that the received traffic indication message is not the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, continuing to receive a traffic indication message corresponding to a next terminal device group; or predicting, according to the group information in the received traffic indication message, a beacon frame of the traffic indication message corresponding to the terminal device group to which the first terminal device belongs, and obtaining the beacon frame at the moment when the beacon frame is sent.

9. The method according to any one of claims 6 to 8, wherein the decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message specifically comprises decoding a bitmap of the delivery traffic indication bit.

10. The method according to any one of claims 6 to 9, wherein the traffic indication message further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

11. The method according to claim 10, wherein the decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message comprises:

when the traffic indication message received by the first terminal device is a traffic indication message corresponding to at least two terminal device groups, obtaining, according to the group information in the received traffic indication message, the delivery traffic indication message corresponding to the terminal device group to which the first terminal device belongs; and decompressing, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message.

12. An access point, comprising:

a compressing unit, configured to compress a delivery traffic indication message and generate a traffic indication message, wherein the delivery traffic indication message is used for indicating whether at least one terminal device associated with the access point has data to receive, and the delivery traffic indication message indicates, through a delivery traffic indication bit corresponding to the at least one terminal device, whether the at least one terminal device has data to receive; and

a transmitting unit, configured to transmit the traffic indication message, wherein the traffic indication message comprises compression method indication information and the compressed delivery traffic indication message, and the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message.

13. The access point according to claim 12, wherein the compressing unit comprises:

a grouping module, configured to group all terminal devices associated with the access point according to a preset number and obtain at least one terminal device group; and

a compressing module, configured to compress the delivery traffic indication message corresponding to the at least one terminal device group, and generate the traffic indication message corresponding to the at least one terminal device group, wherein the delivery traffic indication message is corresponding to one terminal device in the at least one terminal device group, and the at least one terminal device associated with the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message; and

the transmitting unit is specifically configured to transmit the traffic indication message corresponding to the at least one terminal device group, wherein the traffic indication message further comprises group information, the group information is group information used for indicating the terminal device group corresponding to the traffic indication message, and the delivery traffic indication message indicates, through the delivery traffic indication bit corresponding to each terminal device in the terminal device group corresponding to the delivery traffic indication message, whether each terminal device in the terminal device group corresponding to the delivery traffic indication message has data to receive.

14. The access point according to claim 12 or 13, wherein the compressing unit is specifically configured to encode a bitmap of the delivery traffic indication bit.

15. The access point according to any one of claims 12 to 14, wherein the traffic indication message transmitted by the transmitting unit further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

16. The access point according to claim 15, wherein the transmitting unit is specifically configured to sequentially transmit the traffic indication message corresponding to the at least one terminal device group;
or

the transmitting unit is specifically configured to simultaneously transmit the traffic indication message corresponding to the at least one terminal device group.

17. A terminal device, comprising:

a receiving unit, configured to receive a traffic indication message, wherein the traffic indication message comprises compression method indication information and a compressed delivery traffic indication message corresponding to at least one terminal device associated with an access point, the compression method indication information is used for indicating a compression method adopted to compress the delivery traffic indication message corresponding to the at least one terminal device, and the

delivery traffic indication message indicates, through a delivery traffic indication bit, whether the at least one terminal device has data to receive; and

a decompressing unit, configured to decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message, and obtain the delivery traffic indication bit corresponding to the terminal device.

18. The terminal device according to claim 17, wherein the decompressing unit is specifically configured to:

when the traffic indication message received by the receiving unit is a traffic indication message corresponding to one terminal device group, determine, according to the group information in the received traffic indication message, whether the received traffic indication message is the traffic indication message corresponding to the terminal device group to which the terminal device belongs;

when it is determined that the traffic indication message received by the receiving unit is the traffic indication message corresponding to the terminal device group to which the terminal device belongs, decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message; or

when it is determined, according to the group information in the received traffic indication message, that the traffic indication message received by the receiving unit is not the traffic indication message corresponding to the terminal device group to which the terminal device belongs, continue to receive a traffic indication message corresponding to a next terminal device group; or predict, according to the group information in the received traffic indication message, a beacon frame of the traffic indication message corresponding to the terminal device group to which the terminal device belongs, and obtain the beacon frame at the moment when the beacon frame is sent.

19. The terminal device according to claim 17 or 18, wherein the decompressing unit is specifically configured to decode a bitmap of the delivery traffic indication bit.

20. The terminal device according to any one of claim 17 to 19, wherein the traffic indication message received by the receiving unit further comprises bit inverting indication information, used for indicating whether bit inverting is performed on the delivery traffic indication bit in the delivery traffic indication message.

21. The terminal device according to any one of claims 17 to 20, wherein the traffic indication message received by the receiving unit further comprises group information of a terminal device group, the group information is group information used for indicating the terminal device group, the traffic indication message is corresponding to the terminal device group, and the at least one terminal device associated with

the access point is specifically any terminal device in the terminal device group corresponding to the traffic indication message.

22. The terminal device according to claim 21, wherein the decompressing unit is specifically configured to:

when the traffic indication message received by the receiving unit is a traffic indication message corresponding to at least two terminal device groups, obtain, according to the group information in the received traffic indication message, the delivery traffic indication message corresponding to the terminal device group to which the terminal device belongs; and decompress, according to the compression method indicated by the compression method indication information in the received traffic indication message, the delivery traffic indication message in the received traffic indication message.

23. A system for transmitting a traffic indication message, comprising the access point according to claims 12 to 16 and the terminal device according to claims 17 to 22.

24. A program that makes a computer execute the steps of any one of claims 1-11.