CLAIMS

[Claim 1]

A communication apparatus comprising:

acquisition means for acquiring information used for communication with an other communication apparatus in a millimeter-wave band by performing beamforming with the other communication apparatus in the millimeter-wave band; and

transmission means for transmitting an ML (Multi-Link) Probe Request frame including the information acquired by the acquisition means, information associated with a first link operating in the millimeter-wave band, and information associated with a second link operating in a frequency band other than the millimeter-wave band, to the other communication apparatus before the first link and the second link are established,

wherein the communication apparatus requests the other communication apparatus to establish the first link and the second link by transmitting an Association Request frame to the other communication apparatus after transmitting the ML Probe Request frame.

[Claim 2]

The communication apparatus according to Claim 1, wherein

the information acquired by the acquisition means is information on an antenna pattern used for communication with the other communication apparatus in the millimeter-wave band, and the communication apparatus performs communication with the other communication apparatus using the antenna pattern.

[Claim 3]

The communication apparatus according to Claim 1 or 2, wherein

the communication apparatus receives an ML Probe Response frame from the other communication apparatus by transmitting the ML Probe Request frame, and receives an Association Response frame from the other communication apparatus by transmitting the Association Request frame.

[Claim 4]

The communication apparatus according to any one of Claims 1 to 3, wherein

transmission of the ML Probe Request frame, reception of the ML Probe Response frame, transmission of the Association Request frame, and reception of the Association Response frame are performed in a frequency band other than the millimeter-wave band.

[Claim 5]

The communication apparatus according to any one of Claims 1 to 3 wherein

transmission of the ML Probe Request frame, reception of the ML Probe Response frame, transmission of the Association Request frame, and reception of the Association Response frame are performed in the millimeter-wave band.

[Claim 6]

The communication apparatus according to any one of Claims 1 to 5, wherein

the information associated with the first link included in the ML Probe Request frame is Capability information used in the first link operating in the millimeter-wave band, and the information associated with the second link is Capability information used in the second link operating in the frequency band other than the millimeter-wave band.

[Claim 7]

The communication apparatus according to any one of Claims 1 to 6, wherein

the ML Probe Request frame includes a Multi-Link Element, and the Multi-Link Element includes the Capability information.

[Claim 8]

The communication apparatus according to any one of Claims 1 to 7, wherein

the millimeter-wave band is a 45 GHz band or a 60 GHz band.

[Claim 9]

The communication apparatus according to any one of Claims 1 to 8, wherein

the beamforming includes at least one of a Sector-level sweep and a Beam Refinement Protocol.

[Claim 10]

The communication apparatus according to any one of Claims 1 to 9, wherein

the beamforming is performed using a Beacon or a DMG (Directional Multi-Gigabit) Beacon received from the other communication apparatus.

[Claim 11]

A communication apparatus comprising:

acquisition means for acquiring information used for communication with an other communication apparatus in a millimeter-wave band by performing beamforming with the other communication apparatus in the millimeter-wave band; and

transmission means for transmitting an ML Probe Response frame including the information acquired by the acquisition means, information associated with a first link operating in the millimeter-wave band, and information associated with a second link operating in a frequency band other than the millimeter-wave band, to the other communication apparatus before the first link and the

second link are established,

wherein the communication apparatus establishes the first link and the second link with the other communication apparatus by transmitting an Association Response frame to the other communication apparatus after transmitting the ML Probe Response frame.

[Claim 12]

The communication apparatus according to Claim 11, wherein

the information acquired by the acquisition means is information on an antenna pattern used for communication with the other communication apparatus in the millimeter-wave band, and the communication apparatus performs communication with the other communication apparatus using the antenna pattern.

[Claim 13]

The communication apparatus according to Claim 11 or 12, wherein

the communication apparatus transmits the ML Probe Response frame in response to receiving the ML Probe Request frame from the other communication apparatus, and transmits the Association Response frame in response to receiving the Association Request frame from the other communication apparatus.

[Claim 14]

The communication apparatus according to any one of Claims 11 to 13, wherein

reception of the ML Probe Request frame, transmission of the ML Probe Response frame, reception of the Association Request frame, and transmission of the Association Response frame are performed in a frequency band other than the millimeter-wave band.

[Claim 15]

The communication apparatus according to any one of Claims 11 to 13, wherein

reception of the ML Probe Request frame, transmission of the ML Probe Response frame, reception of the Association Request frame, and transmission of the Association Response frame are performed in the millimeter-wave band.

[Claim 16]

The communication apparatus according to any one of Claims 11 to 15, wherein

the information associated with the first link included in the ML Probe Response frame is Capability information used in the first link operating in the millimeter-wave band, and the information associated with the second link is Capability information used in the second link operating in the frequency band other than the millimeter-wave band.

[Claim 17]

The communication apparatus according to any one of Claims 11 to 16, wherein

the ML Probe Response frame includes a Multi-Link Element, and the Multi-Link Element includes the Capability information.

[Claim 18]

A communication apparatus comprising:

selection means for selecting a predetermined link for performing an establishment process for establishing a first link and a second link, based on a frequency for the first link and a frequency for the second link; and

establishment means for performing a connection process with an other communication apparatus via the predetermined link selected by the selection means to

establish the first link and the second link in parallel between the communication apparatus and the other communication apparatus.

[Claim 19]

The communication apparatus according to Claim 18,wherein

the selection means selects, as the predetermined link, a link having a higher frequency among the first link and the second link.

[Claim 20]

The communication apparatus according to Claim 18 or 19, wherein

in a case where the first link is a link via a frequency channel in a millimeter-wave band, and

the second link is a link via a frequency channel in a frequency band that is not the millimeter-wave band, the selection means selects the first link as the predetermined link.

[Claim 21]

The communication apparatus according to any one of Claims 18 to 20, wherein

the millimeter-wave band is a 45 GHz band or a 60 GHz band.

[Claim 22]

A method for controlling a communication apparatus, the method comprising:

acquiring information used for communication with an other communication apparatus in a millimeter-wave band by performing beamforming with the other communication apparatus in the millimeter-wave band; and

transmitting an ML Probe Request frame including the information acquired in the acquiring, information associated with a first link operating in the millimeter-

wave band, and information associated with a second link operating in a frequency band other than the millimeter-wave band, to the other communication apparatus before the first link and the second link are established,

wherein the communication apparatus requests the other communication apparatus to establish the first link and the second link by transmitting an Association Request frame to the other communication apparatus after transmitting the ML Probe Request frame.

[Claim 23]

A method for controlling a communication apparatus, the method comprising:

acquiring information used for communication with an other communication apparatus in a millimeter-wave band by performing beamforming with the other communication apparatus in the millimeter-wave band; and

transmitting an ML Probe Response frame including the information acquired in the acquiring, information associated with a first link operating in the millimeter-wave band, and information associated with a second link operating in a frequency band other than the millimeter-wave band, to the other communication apparatus before the first link and the second link are established,

wherein the communication apparatus establishes the first link and the second link with the other communication apparatus by transmitting an Association Response frame to the other communication apparatus after transmitting the ML Probe Response frame.

[Claim 24]

A method for controlling a communication apparatus, the method comprising:

selecting a predetermined link for performing an establishment process for establishing a first link and a

second link, based on a frequency for the first link and a frequency for the second link; and

performing a connection process with an other communication apparatus via the predetermined link selected in the selecting to establish the first link and the second link in parallel between the communication apparatus and the other communication apparatus.

[Claim 25]

A program for causing a computer to perform the method for controlling a communication apparatus according to any one of Claims 22 to 24.