

CLAIMS

[Claim 1]

A communication apparatus comprising:

communication means for communicating a media access control (MAC) frame compliant with an Institute of Electrical and Electronics Engineers (IEEE) 802.11 series standard with another communication apparatus,

establishment means for establishing a plurality of links on a plurality of different frequency channels with a partner apparatus,

wherein the MAC frame communicated by the communication means includes a multi-link element as information related to communications via the plurality of links, and

wherein the multi-link element includes a common info field and a link info field, and the common info field includes a field capable of indicating a frequency gap between frequency channels recommended for a communication apparatus which transmits the MAC frame including the multi-link element, in the communications via the plurality of links, to perform the communications via the plurality of links asynchronously.

[Claim 2]

The communication apparatus according to Claim 1, wherein the multi-link element includes information corresponding to a frequency channel related to the plurality of links.

[Claim 3]

The communication apparatus according to Claim 1 or 2, wherein the MAC frame including the multi-link element further includes information indicating whether the apparatus transmits the MAC frame including the multi-link element supports, in the communications via the plurality of links, a first mode in which the communications via the plurality of links are synchronously performed.

[Claim 4]

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

the MAC frame including the multi-link element further includes information indicating whether the apparatus transmits the MAC frame including the multi-link element supports, in the communications via the plurality of links, a second mode in which the communications via the plurality of links are asynchronously performed.

[Claim 5]

The communication apparatus according to Claim 4, wherein, in a case where the information indicating supporting of the second mode is included, the MAC frame including the multi-link element further includes information indicating a distance between frequency channels that are supported by the apparatus transmits the MAC frame including the multi-link element in the second mode.

[Claim 6]

The communication apparatus according to any one of Claims 1 to 5, wherein the MAC frame including the multi-link element further includes information indicating a maximum number of links that can be established in the communications via the plurality of links by the apparatus transmits the MAC wireless frame including the multi-link element.

[Claim 7]

The communication apparatus according to any one of Claims 1 to 6, wherein the establishment means identifies a frequency channel at least based on the multi-link element included in the MAC frame communicated by the communication means and establishes the plurality of links based on the identified frequency channel.

[Claim 8]

The communication apparatus according to any one of Claims 1 to 7, further comprising:

reception means for receiving, in a case where the communication means receives the MAC frame including the multi-link element from the another communication apparatus, another MAC frame including the multi-link element and including information corresponding to a frequency channel to be used in the

communications via the plurality of links with the another communication apparatus,

wherein the establishment means further establishes a link for performing the communications via the plurality of links with the another communication apparatus using the frequency channel to which the information included in the another MAC frame including the multi-link element received by the reception means corresponds.

[Claim 9]

The communication apparatus according to any one of Claims 1 to 7, further comprising:

transmission means for transmitting, in a case where the communication means transmits the MAC frame including the multi-link element to the another communication apparatus, another MAC frame including the multi-link element and including information corresponding to a frequency channel to be used in the communications via the plurality of links with the another communication apparatus,

wherein the establishment means further establishes a link for performing the communications via the plurality of links with the another communication apparatus using the frequency channel to which the information included in the another MAC frame including the multi-link element transmitted by the transmission means corresponds.

[Claim 10]

The communication apparatus according to Claim 8 or 9, wherein the MAC frame including the multi-link element is at least either one of a Beacon and a Probe Response.

[Claim 11]

The communication apparatus according to any one of Claims 1 to 8, further comprising reception means for receiving, in a case where the communication means transmits the MAC frame including the multi-link element to the another communication apparatus, another MAC frame including the multi-link element and including information corresponding to a frequency channel to be used in the communications via the plurality of links with the another communication apparatus.

[Claim 12]

The communication apparatus according to any one of Claims 1 to 7, further comprising transmission means for transmitting, in a case where the communication means receives the MAC frame including the multi-link element from the another communication apparatus, another predetermine MAC frame including the multi-link element and including information corresponding to a frequency channel to be used in the communications via the plurality of links with the another communication apparatus and information indicating a bandwidth to be used in the communications via the plurality of links with the another communication apparatus.

[Claim 13]

The communication apparatus according to Claim 11 or 12, wherein the MAC frame including the multi-link element is a Probe Request.

[Claim 14]

The communication apparatus according to Claim 1, wherein the multi-link element includes information corresponding to a frequency channel for establishing a link for performing the communications between the communication apparatus and the another apparatus via the plurality of links, among the plurality of frequency channels where the wireless communication compliant with the IEEE 802.11 series standard can be performed.

[Claim 15]

The communication apparatus according to Claim 1 or 15, wherein the MAC frame including the multi-link element further includes information indicating a bandwidth of a link to be established in the communications via the plurality of links by the apparatus transmits the MAC frame including the multi-link element.

[Claim 16]

The communication apparatus according to any one of Claims 1, 14, and 15, wherein the MAC frame including the multi-link element further includes information indicating whether a first mode in which the communications via the plurality of links are

performed synchronously is used in the communications via the plurality of links between the communication apparatus and the another communication apparatus.

[Claim 17]

The communication apparatus according to any one of Claims 1 and 14 to 16, wherein the MAC frame including the multi-link element further includes information indicating whether a second mode in which the communications via the plurality of links are performed asynchronously is used in the communications via the plurality of links between the communication apparatus and the another communication apparatus.

[Claim 18]

The communication apparatus according to any one of Claims 1 and 14 to 17, further comprising:

generation means for generating the MAC frame including the multi-link element,

wherein the communication means is configured to transmit the MAC frame including the multi-link element generated by the generation means.

[Claim 19]

The communication apparatus according to any one of Claims 1 and 14 to 17, wherein the establishment means establishes, in a case where the MAC frame including the multi-link element is received, a link for performing the communications via the plurality of links with the another communication apparatus using the information corresponding to the frequency channel included in the MAC frame including the multi-link element.

[Claim 20]

The communication apparatus according to Claim 18 or 19, wherein the MAC frame including the multi-link element is an Association Response.

[Claim 21]

The communication apparatus according to Claim 2, wherein the multi-link element includes the information corresponding to a frequency channel that is

information corresponding to a frequency channel on which a request to establish a link is performed in the communications via the plurality of links between the communication apparatus and another communication apparatus.

[Claim 22]

The communication apparatus according to Claim 1 or 21, wherein the MAC frame including the multi-link element further includes information indicating a bandwidth that is requested in the communications via the plurality of links by the apparatus transmits the MAC frame including the multi-link element.

[Claim 23]

The communication apparatus according to any one of Claims 1, 21, and 22, wherein the MAC frame including the multi-link element further includes information indicating whether a first mode in which the communications via the plurality of links are performed synchronously is requested in the communications via the plurality of links between the communication apparatus and the another communication apparatus.

[Claim 24]

The communication apparatus according to any one of Claims 1 and 21 to 23, wherein the MAC frame including the multi-link element further includes information indicating whether a second mode in which the communications via the plurality of links are performed asynchronously is requested in the communications via the plurality of links between the communication apparatus and the another communication apparatus.

[Claim 25]

The communication apparatus according to Claim 24, wherein in a case where information indicating a request for the second mode is included, the MAC frame including the multi-link element further includes information indicating a distance between frequency channels that is requested in the second mode by the apparatus transmits the MAC frame including the multi-link element.

[Claim 26]

The communication apparatus according to any one of Claims 1 and 21 to 25,

further comprising:

generation means for generating the MAC frame including the multi-link element,

wherein the communication means is configured to transmit the MAC frame including the multi-link element generated by the generation means.

[Claim 27]

The communication apparatus according to any one of Claims 1 and 20 to 24, further comprising:

transmission means for transmitting, in a case where the communication means receives the MAC frame including the multi-link element, another MAC frame including the multi-link element including information corresponding to a frequency channel to be used in the communications via the plurality of links with the another communication apparatus; and

wherein the establishment means establishes a link for performing the communications via the plurality of links with the another communication apparatus using the information corresponding to the frequency channel included in the another MAC frame including the multi-link element transmitted by the transmission means.

[Claim 28]

The communication apparatus according to Claim 26 or 27, wherein the MAC frame including the multi-link element is an Association Request.

[Claim 29]

A communication method comprising:

performing a communication where a communication apparatus and another communication apparatus communicate a media access control (MAC) frame compliant with an IEEE 802.11 series standard,

establishing a plurality of links on a plurality of different frequency channels where multi-link communication can be performed with a partner apparatus,

wherein a MAC frame including the multi-link element communicated in the

communication includes a multi-link element as information related to communications via the plurality of links, and

wherein the multi-link element includes a common info field and a link info field, and the common info field includes a field capable of indicating a frequency gap between frequency channels recommended for a communication apparatus which transmits the MAC frame including the multi-link element, in the communications via the plurality of links, to perform the communications via the plurality of links asynchronously.

[Claim 30]

A program for causing a computer to function as the means of the communication apparatus according to any one of Claims 1 to 28.