

order to schedule allocations on one or more channels (e.g., with a channel bandwidth of 2.16 GHz).

Citation List

Non-Patent Literature

[0006]

NPL 1: IEEE 802.11-15/1358r6, Specification Framework for TGay, October 2016

NPL 2: IEEE 802.11-16/1208r0, Scheduling Allocation on Multi-channels in 11ay, September 2016

NPL 3: IEEE Std 802.11adTM-2012, Section 8.4.2.134 Extended Schedule Element, Page 149-151, December 2012

NPL 4: IEEE Std 802.11adTM-2012, Section 9.33.6 Channel Access in Scheduled DTI, page 251-254, December 2012

Summary

[0007]

However, a study on performing efficient scheduling under an environment where a plurality of standards coexist has been insufficient.

[0008]

Non-limiting embodiments of the present disclosure contribute to providing a transmitting apparatus and a receiving apparatus that can execute efficient scheduling for allocations on one or more channels in a network.

[0008a]

In a first aspect, the present disclosure provides a transmission apparatus comprising: a transmission-signal generating circuit which, in operation, a MAC frame including a first type of schedule element and a second type of schedule element, the first type of schedule element corresponding to channel allocation(s) over a primary channel and the second type of schedule element corresponding to channel allocation(s) over a plurality of channels; and a transmitting circuit which, in operation, transmits the generated MAC frame over the primary channel, wherein, for a channel allocation where the plurality of channels includes the primary channel, the first type of schedule element includes an Allocation field containing allocation time information; and the second type of schedule element includes a Channel Allocation field containing supplemental allocation information to the Allocation field in the first type of schedule element, and wherein, for

another channel allocation where the plurality of channels does not include the primary channel, the second type of schedule element includes a Channel Allocation field containing complete allocation information regarding the other channel allocation over the plurality of channels.

[0008b]

In a second aspect, the present disclosure provides a transmission method comprising: generating a MAC frame including a first type of schedule element and a second type of schedule element, the first type of schedule element corresponding to channel allocation(s) over a primary channel and the second type of schedule element corresponding to channel allocation(s) over a plurality of channels; and transmitting the generated MAC frame over the primary channel, wherein, for a channel allocation where the plurality of channels includes the primary channel, the first type of schedule element includes an Allocation field containing allocation time information; and the second type of schedule element includes a Channel Allocation field containing supplemental allocation information to the Allocation field in the first type of schedule element, and wherein, for another channel allocation where the plurality of channels does not include the primary channel, the second type of schedule element includes a Channel Allocation field containing complete allocation information regarding the other channel allocation over the plurality of channels.

[0009]

A transmitting apparatus according to one embodiment of the present disclosure comprises: a transmission-signal generating circuit that generates at least one of a first type of schedule element corresponding to an allocation involving a single channel and a second type of schedule element corresponding to an allocation involving a plurality of channels and that generates a MAC frame including the generated first type or second type of schedule element; and a transmitting circuit that transmits the MAC frame over a first channel. When the allocation involving the plurality of channels includes the first channel, the transmission-signal generating circuit generates the first type of schedule element including all information of information regarding the allocation involving the plurality of channels and generates the second type of schedule element including difference information indicating the generated first type of schedule element, and when the

allocation involving the plurality of channels does not include the first channel, the transmission-signal generating circuit omits the generation of the first type of schedule element and generates the second type of schedule element including all information of the information regarding the allocation involving the plurality of channels.

[0010]

It should be noted that general or specific aspects may be implemented as a system, a method, an integrated circuit, a computer program, or a recording medium or may be implemented as an arbitrary combination of a system, an apparatus, a method, an integrated circuit, a computer program, and a recording medium.

[0011]

One embodiment of the present disclosure is to contribute to executing efficient scheduling for allocations on one or more channels in a network.

[0012]

Additional benefits and advantages of one embodiment of the present disclosure will become apparent from the specification and drawings. The benefits and/or advantages are individually provided by some embodiments and features in the specification and drawings, which need not all be provided in order to obtain one or more of the same features.

Brief Description of Drawings

[0013]

[Fig. 1] Fig. 1 is a diagram illustrating one example of a wireless network including a PCP/AP and a plurality of STAs.

[Fig. 2] Fig. 2 is a diagram illustrating one example of allocation scheduling for a primary channel in a beacon interval in the wireless network.

[Fig. 3] Fig. 3 is a diagram illustrating one example of channel bandwidths in channelization.

[Fig. 4] Fig. 4 is a diagram illustrating one example of scheduling of allocations on one or more channels in a beacon interval in the wireless network.

[Fig. 5] Fig. 5 is a diagram illustrating one example of the format of an ESE.

[Fig. 6] Fig. 6 is a diagram illustrating one example of the format of an EDMG_ESE.

[Fig. 7] Fig. 7 is a diagram illustrating a first example of an EDMG_ESE and

CLAIMS

[Claim 1]

A transmission apparatus comprising:

a transmission-signal generating circuit which, in operation, generates a MAC frame including a first type of schedule element and a second type of schedule element, the first type of schedule element corresponding to channel allocation(s) over a primary channel and the second type of schedule element corresponding to channel allocation(s) over a plurality of channels; and

a transmitting circuit which, in operation, transmits the generated MAC frame over the primary channel,

wherein, for a channel allocation where the plurality of channels includes the primary channel,

the first type of schedule element includes an Allocation field containing allocation time information; and

the second type of schedule element includes a Channel Allocation field containing supplemental allocation information to the Allocation field in the first type of schedule element, and

wherein, for another channel allocation where the plurality of channels does not include the primary channel,

the second type of schedule element includes a Channel Allocation field containing complete allocation information regarding the other channel allocation over the plurality of channels.

[Claim 2]

The transmitting apparatus according to Claim 1,

wherein the first type of schedule element is an Extended Schedule element that complies with an IEEE 802.11ad standard, and

the second type of schedule element is an EDMG (Enhanced Directional Multi-Gigabit) Extended Schedule element that complies with an IEEE 802.11ay standard.

[Claim 3]

The transmitting apparatus according to Claim 1,

wherein the MAC frame is either a DMG (Directional Multi-Gigabit) Beacon frame or an Announce

frame.

[Claim 4]

The transmitting apparatus according to Claim 1,
wherein the second type of schedule element comprises one or more Channel Allocation fields, and each of the Channel Allocation fields comprises a signaling type subfield indicating whether the supplemental allocation information to the Allocation field is included or the complete allocation information is included in the Channel Allocation field itself.

[Claim 5]

The transmission apparatus according to Claim 4, wherein the supplemental allocation information includes bandwidth information of a corresponding channel allocation.

[Claim 6]

A transmission method comprising:
generating a MAC frame including a first type of schedule element and a second type of schedule element, the first type of schedule element corresponding to channel allocation(s) over a primary channel and the second type of schedule element corresponding to channel allocation(s) over a plurality of channels; and
transmitting the generated MAC frame over the primary channel,
wherein, for a channel allocation where the plurality of channels includes the primary channel,
the first type of schedule element includes an Allocation field containing allocation time information; and
the second type of schedule element includes a Channel Allocation field containing supplemental allocation information to the Allocation field in the first type of schedule element, and
wherein, for another channel allocation where the plurality of channels does not include the primary channel,
the second type of schedule element includes a Channel Allocation field containing complete allocation information regarding the other channel allocation over the plurality of channels.

[Claim 7]

The transmitting method according to Claim 6,
wherein the first type of schedule element is an Extended Schedule element that complies with an IEEE 802.11ad standard, and
the second type of schedule element is an EDMG (Enhanced Directional Multi-Gigabit) Extended Schedule element that complies with an IEEE 802.11ay standard.

[Claim 8]

The transmitting method according to Claim 6,
wherein the MAC frame is either a DMG (Directional Multi-Gigabit) Beacon frame or an Announce frame.

[Claim 9]

The transmitting method according to Claim 6,
wherein the second type of schedule element comprises one or more Channel Allocation fields, and each of the Channel Allocation fields comprises a signaling type subfield indicating whether the supplemental allocation information to the Allocation field is included or the complete allocation information is included in the Channel Allocation field itself.

[Claim 10]

The transmission method according to Claim 9, wherein the supplemental allocation information includes bandwidth information of a corresponding channel allocation.