COMMUNICATION APPARATUS AND COMMUNICATION METHOD FOR MULTI-AP JOINT TRANSMISSION

BACKGROUND

1. TECHNICAL FIELD

[0001] The present disclosure generally relates to communication apparatus and methods for electronic devices and systems, and more particularly relates to joint transmission in multi-AP networks.

2. DESCRIPTION OF RELATED ART

[0002] Wireless networks that communicate via multi-AP joint transmission enable electronic devices to communication in networks with joint transmissions sent to multiple electronic devices. Such networks have advantages over other wireless networks in which wireless communication is limited to a single transmission to one electronic device.

SUMMARY

[0003] One non-limiting and exemplary embodiment facilitates providing joint transmission communication in multi-AP networks. By way of example, this communication includes joint transmission from two or more of an access point (AP) to one or more wireless station (STA).

In one general aspect, the techniques disclosed here feature an access point (AP). The access point includes circuitry, which, in operation, generates a frame including joint transmission (JT) data and a JT identity that uniquely identifies the JT data; and a transmitter, which, in operation, transmits the frame to one or more other APs that jointly transmit the JT data to a communication apparatus. In one aspect, there is an access point , AP, comprising:circuitry, which, in operation, encapsulates joint transmission, JT, data, and generates a frame including encapsulated JT data and a JT identity that uniquely identifies the JT data; and a transmitter, which, in operation, transmits the frame to one or more other APs that jointly transmit the JT data to a communication apparatus, and transmits a JT trigger frame including the JT identity to the one or more other APs,

characterized in that the encapsulated JT data and the JT identity in a JT Packet ID field are included in the frame. In another aspect, there is a communication method comprising encapsulating joint transmission, JT, data; generating, at a first access point, AP, a frame including the encapsulated JT data and a JT identity that uniquely identifies the JT data; transmitting, from the first AP, the frame to one or more second APs that jointly transmit the JT data to a communication apparatus; and transmitting, from the first AP, a JT trigger frame including the JT identity to the one or more other APs, characterized in that the encapsulated JT data and the JT identity in a JT Packet ID field are included in the frame

CLAIMS

What is claimed is:

1. An access point, AP, comprising:

circuitry, which, in operation, encapsulates joint transmission, JT, data, and generates a frame including encapsulated JT data and a JT identity that uniquely identifies the JT data; and

a transmitter, which, in operation, transmits the frame to one or more other APs that jointly transmit the JT data to a communication apparatus, and transmits a JT trigger frame including the JT identity to the one or more other APs,

characterized in that

the encapsulated JT data and the JT identity in a JT Packet ID field are included in the frame.

3. The access point of claim 1, wherein the JT trigger frame includes a MAC address of the communication apparatus.

4. The access point of claim 1, wherein the JT data is carried as a payload of an Ethertype 89-0d frame body.

5. The access point of claim 1, wherein the frame is one of an IEEE 802.11 data frame and an Ethernet frame.

6. The access point of claim 1, wherein the JT data is one or more MAC Protocol Data Units, MPDU, addressed to the communication apparatus.

7. The access point of claim 1, wherein the JT identity is one of a uniquely assigned JT packet ID, a value of a Sequence Number subfield within a Sequence Control field of an encapsulating IEEE 802.11 data frame, and value of a Sequence Number subfield within a Sequence Control field of a MPDU within a JT Data.

8. The access point of claim 1, wherein JT data has higher layer payload and common fields required by the receiving APs to locally construct one or more MAC Protocol Data Units, MPDU, jointly transmitted to the communication apparatus.

9. The access point of claim 1, wherein the JT data is carried as a payload of an IEEE 802.11 Data frame using a four address MAC header format; a MAC header of the IEEE 802.11 Data frame includes a control field that indicates a Sequence Control field of the

IEEE 802.11 Data frame to be jointly transmitted; and the JT identifier includes a value of a Sequence Number subfield within the Sequence Control field.

10. The access point of claim 1, wherein the access point negotiates an AP Coordination session with the one or more other APs, the AP Coordination session specifies an AP coordination scheme as Joint Transmission, and the AP Coordination session is identified by a session ID.

11. The access point of claim 1, wherein the access point transmits a PHY Protocol Data Unit, PPDU, constructed from the JT data after a fixed duration from an end of a JT Trigger frame.

12. A communication method comprising:

encapsulating joint transmission, JT, data;

generating, at a first access point, AP, a frame including the encapsulated JT data and a JT identity that uniquely identifies the JT data;

transmitting, from the first AP, the frame to one or more second APs that jointly transmit the JT data to a communication apparatus; and

transmitting, from the first AP, a JT trigger frame including the JT identity to the one or more other APs,

characterized in that

the encapsulated JT data and the JT identity in a JT Packet ID field are included in the frame.

13. The communication method according to claim 12 further comprising:

synchronizing PHY and MAC parameters at the more APs such that the JT data received by the communication apparatus from the more APs are exactly the same.