

CLAIMS

What is claimed is:

1. An access point for a wireless local area network (WLAN), comprising:
a processing device;
a transceiver; and
a memory having a plurality of instructions stored thereon which, when executed by the processing device, cause the processing device to cause the transceiver to:
broadcast a beacon frame including information which defines a poll period during which a group of stations are allowed to send power save poll (PS-Poll) frames;
receive during the poll period a PS-poll frame from a station of the group of stations for which the access point has a data packet buffered thereon;
send in the poll period, an acknowledgement (ACK) frame to the station in response to the PS-Poll frame, wherein the station is only awake during the poll period when sending the PS-poll frame to the access point and when receiving the ACK frame;
after the poll period, send a downlink schedule frame intended for the station to which the ACK frame was sent to, the downlink scheduling frame comprising information indicating a wakeup time for the station; and
send the data packet to the station at or after the wakeup time.
2. The access point according to claim 1, wherein the polling period is protected by a Network Allocation Vector (NAV) set by the access point.
3. The access point according to claim 1, wherein the beacon frame further comprises information that defines a data delivery period allocated after the poll period, and the transceiver sends the downlink schedule frame to the station at the beginning of the data delivery period.
4. The access point according to claim 1, wherein the ACK frame includes the wakeup time.
5. The access point according to claim 1, wherein the transceiver sends the data packet to the station via a multi-user multiple-input multiple-output (MU-MIMO) transmission.

6. A method for data transmission in a wireless local area network (WLAN), comprising:
 broadcasting, by an access point (AP), a beacon frame comprising information that defines a poll period during which a group of stations are allowed to send power save poll (PS-Poll) frames;

in the poll period, receiving, by the AP, a PS-Poll frame from a station of the group of stations for which the AP has a data packet buffered thereon;

in the poll period, sending, by the AP, an acknowledgement (ACK) frame to the station in response to the PS-Poll frame, wherein the station is only awake during the poll period when sending the PS-poll frame to the access point and when receiving the ACK frame;

after the polling period, sending, by the AP, a downlink schedule frame intended for the station to which the ACK frame was sent to, the downlink schedule frame comprising information indicating a wakeup time for the station to the station; and

sending, by the AP, the data packet to the station not earlier than the wakeup time.

7. The method according to claim 6, comprising:

protecting, by the AP, the polling period by setting a Network Allocation Vector (NAV).

8. The method according to claim 6, wherein the beacon frame further comprises information defining a data delivery period allocated after the polling, and the AP sends the downlink schedule frame at the beginning of the data delivery period.

9. The method according to claim 6, wherein the AP multicasts the downlink schedule frame to the station.

10. The method according to claim 8, comprising:

indicating, by the AP, to the station a time for sending the PS-Poll frame, wherein the time for sending the PS-Poll frame is defined as a function of a position of the station in a traffic information map (TIM) in the beacon frame.

11. The method according to claim 6, wherein the sending the data packet to the station comprises:

sending, by the AP, the data packet to the station via a multi-user multiple-input multiple-output (MU-MIMO) transmission, at or after the wakeup time.

12. A station for a wireless local area network (WLAN), comprising:
 - a processing device; and
 - a memory having a plurality of instructions stored thereon which, when executed by the processing device, cause the processing device to implement operations comprising:
 - receiving from an access point (AP) a beacon frame comprising information that defines a polling period during which the station is allowed to send a power save poll (PS-Poll) frame;
 - after determining that the AP has a data packet buffered for the station, sending the PS-Poll frame to the AP in the polling period;
 - receiving from the AP an acknowledgement (ACK) frame responsive to the PS-Poll frame in the polling period, wherein the station is only awake during the polling period when sending the PS-poll frame to the AP and when receiving the ACK frame;
 - after the polling period, receiving from the AP a downlink schedule frame comprising information indicating a wakeup time for the station; and
 - being awake at the wakeup time, and receiving the data packet sent from the AP.

13. The station according to claim 12, wherein the sending the PS-Poll frame comprises:
 - sending the PS-Poll frame at a time defined as a function of a position of the station in a traffic indication map (TIM) included in the beacon frame.

14. The station according to claim 13, wherein the operations further comprise:
 - after receiving the beacon frame, going into a sleep state until the time of sending the PS-Poll frame.

15. The station according to claim 12, wherein the beacon frame comprises information defining a data delivery period allocated after the polling period, and the receiving the downlink schedule frame from the AP comprises:
 - receiving the downlink schedule frame at the beginning of the data delivery period.