

Claims

1. A method comprising:

5 performing, by a wireless device by using a first radio interface of the wireless device, an association to an access node of a wireless network;

indicating, by the wireless device to the associated access node, transition to a dormant mode and entering the dormant mode where the first radio interface is disabled;

10 receiving, by the wireless device in the dormant mode, a wake-up frame from the access node through a second radio interface of the wireless device;

15 upon receiving the wake-up frame, maintaining the dormant mode towards the access node but temporarily enabling, by the wireless device, the first radio interface to receive at least one frame from the access node;

20 receiving said at least one frame by the wireless device through the first radio interface and, upon receiving said at least one frame, disabling the first radio interface in the dormant mode.

2. The method of claim 1, wherein the wireless device switches, upon receiving the wake-up frame, from a doze state of the dormant mode to an active state of the dormant mode, and wherein the wireless device switches, upon receiving said at least one frame, from the active state of the dormant mode to the doze state of the dormant mode.

25 3. The method of claim 2, wherein the wireless device further enables the first radio interface in the dormant mode and switches to the active state upon maintaining the doze state for a determined time interval.

4. The method of any preceding claim 2 to 3, wherein the wireless device further enables the first radio interface in the dormant mode and switches to the active state upon determining to transmit a frame to the access node.
- 5 5. The method of any preceding claim, wherein the first radio interface is disabled in the dormant mode at least for a duration longer than a beacon transmission interval of the access node.
- 10 6. The method of any preceding claim, wherein the wireless device further switches, according to a determined criterion, from the dormant mode to a power management mode where the first radio interface is enabled and the second radio interface is disabled.
- 15 7. The method of claim 8, wherein the power management mode is a power-save mode or an active mode according to IEEE 802.11 specifications.

8. An apparatus for a wireless device, the apparatus comprising:

at least one processor; and

at least one memory including a computer program code, wherein the at least one memory
5 and the computer program code are configured, with the at least one processor, to cause
the apparatus to:

perform, by using a first radio interface of the wireless device, an association to an access
10 node of a wireless network;

indicate, to the associated access node, transition to a dormant mode and enter the dormant
mode where the first radio interface is disabled;

receive, in the dormant mode, a wake-up frame from the access node through a second
15 radio interface of the wireless device;

upon receiving the wake-up frame, maintain the dormant mode towards the access node
but temporarily enable the first radio interface to receive at least one frame from the access
20 node;

receive said at least one frame through the first radio interface and, upon receiving said at least one frame, disable the first radio interface in the dormant mode.

5 9. The apparatus of claim 8, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to switch, upon receiving the wake-up frame, from a doze state of the dormant mode to an active state of the dormant mode, and to switch, upon receiving said at least one frame, from the active state of the dormant mode to the doze state of the dormant mode.

10 10. The apparatus of claim 9, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to enable the first radio interface in the dormant mode and to switch to the active state upon maintaining the doze state for a determined time interval.

15 11. The apparatus of any preceding claim 9 to 10, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to enable the first radio interface in the dormant mode and switch to the active state upon determining to transmit a frame to the access node.

20 12. The apparatus of any preceding claim 8 to 11, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to disable the first radio interface in the dormant mode at least for a duration longer than a beacon transmission interval of the access node.

25 13. The apparatus of any preceding claim 8 to 12, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to switch, according to a determined criterion, from the dormant mode to a

power management mode where the first radio interface is enabled and the second radio interface is disabled.

5 14. The apparatus of claim 13, wherein the power management mode is a power-save mode or an active mode according to IEEE 802.11 specifications.

10 15. The apparatus of claim 13 or 14, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to transmit, when switching from the dormant mode to the power management mode, an uplink frame to the access node, wherein the uplink frame comprises an information element indicating said switching from the dormant mode to the power management mode.

15 16. The apparatus of claim 8 to 15, wherein the first radio interface employs a first radio access technology and the second radio interface employs a second radio access technology different from the first radio access technology.

20 17. An apparatus for an access node of a wireless network, the apparatus comprising:
at least one processor; and
at least one memory including a computer program code, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to:

25 perform, by using a first radio interface of the access node, an association to a wireless device;

receive, from the associated wireless device, an indication that the wireless device shall transition to a dormant mode where the wireless device cannot be contacted by the access node by using the first radio interface;

30 determine to transmit at least one frame to the wireless device and, upon said determining, use a second interface of the access node to transmit a wake-up frame to the wireless device;

35 after transmitting said wake-up frame, maintain information that the wireless device is in the dormant mode and use the first radio interface to transmit the at least one frame to the wireless device.

18. The apparatus of claim 17, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to perform, upon completing the transmission of the at least one frame to the wireless device, the next communication with the wireless device through the second radio interface unless the access node receives an explicit indication that the wireless device has transitioned from the dormant mode.

19. The apparatus of any preceding claim 17 to 18, wherein the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to receive, from the wireless device, a frame comprising an information element indicating that the wireless device has switched from the dormant mode to a power management mode where the wireless device can be reached through the first radio interface but not through the second radio interface.

20. The apparatus of any preceding claim 17 to 19, wherein the first radio interface employs a first radio access technology and the second radio interface employs a second radio access technology different from the first radio access technology.