

wireless communication technologies have features and advantages that make them appropriate for various applications.

SUMMARY

Method, apparatus, and computer program product embodiments of the invention are disclosed to improve the discovery of wireless networks.

In ~~an example embodiment~~ a first aspect of the present invention, a method is provided. The method comprises:

transmitting a wireless message including at least one condition for response from one or more wireless devices, the condition for response including at least one of receive power of the wireless message at the one or more wireless devices, service level of the one or more wireless devices, or identity of the one or more wireless devices that can respond with a selected response; and

receiving one or more responses from the one or more wireless devices that can satisfy the at least one condition.

In an example embodiment of the invention, the method further comprises: wherein the wireless message is a probe request or a generic advertisement service request.

In an example embodiment of the invention, the method further comprises: wherein the wireless message includes a receive power threshold value and the condition for response is that receive power of the wireless message at the one or more wireless devices is above the receive power threshold value.

In an example embodiment of the invention, the method further comprises: wherein the wireless message includes one or more service level related threshold values including BSS Load threshold, BSS Average Access Delay threshold, BSS Available Admission Capacity threshold, BSS AC Delay threshold, or Extended BSS Load Element threshold and the condition for response is that the BSS Load, BSS Average Access Delay, BSS Available Admission Capacity, BSS AC Delay, or Extended BSS Load Element of the one or more wireless devices is below the respective threshold value.

In an example embodiment of the invention, the method further comprises: wherein the wireless message includes a specification of one or more types of selected responses from the one or more identified wireless devices, including a control frame, a short probe response, a measurement pilot or a beacon frame.

In an example embodiment of the invention, the method further comprises:
wherein the wireless message is a first management frame and the one or more responses are second management frames.

5 In an example embodiment of the invention, the method further comprises:
wherein the wireless message is at least one of a broadcast message and a groupcast message.

In an example embodiment of the invention, the method further comprises:
wherein the one or more identified wireless devices are known from a location database.

10 In an example embodiment of the invention, the method further comprises:
wherein the one or more responses from the one or more wireless devices are forwarded by the one or more wireless devices to another wireless device.

In an example embodiment of the invention, the method further comprises:
receiving one or more types of selected responses from the one or more identified
15 wireless devices, including a control frame, a short probe response, a measurement pilot or a beacon frame; and

assessing a quality of a link to the one or more identified wireless devices using the received response.

20 ~~In an example embodiment~~ a second aspect of the present invention, an apparatus is provided. The apparatus comprises:

at least one processor;

at least one memory including computer program code;

the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:

25 transmit a wireless message including at least one condition for response from one or more wireless devices, the condition for response including at least one of receive power of the wireless message at the one or more wireless devices, service level of the one or more wireless devices, or identity of the one or more wireless devices that can respond with a selected response; and

30 receive one or more responses from the one or more wireless devices that can satisfy the at least one condition.

~~In an example embodiment~~ a third aspect of the present invention, a computer program product is provided. The computer program product comprising comprises
computer executable program code recorded on a computer readable, non-

transitory storage medium, the computer executable program code, when executed by a computer processor, comprising:

code for transmitting a wireless message including at least one condition for response from one or more wireless devices, the condition for response including at least one of receive power of the wireless message at the one or more wireless devices, service level of the one or more wireless devices, or identity of the one or more wireless devices that can respond with a selected response; and

code for receiving one or more responses from the one or more wireless devices that can satisfy the at least one condition.

In an ~~example embodiment~~ a fourth aspect of the present invention, a method is provided. The method comprises:

receiving by an apparatus, a wireless message from a sending device, including at least one condition for response from the apparatus, the condition for response including at least one of receive power of the wireless message at the apparatus, service level of the apparatus, or identity of the apparatus and that the apparatus can respond with a selected response;

determining by the apparatus that it can satisfy the at least one condition; and transmitting a response by the apparatus.

In an example embodiment of the invention, the method further comprises:

wherein the wireless message is a probe request or a generic advertisement service request.

In an example embodiment of the invention, the method further comprises:

wherein the wireless message includes a receive power threshold value and the condition for response is that receive power of the wireless message at the apparatus is above the receive power threshold value; and

determining by the apparatus that it can satisfy the at least one condition that the receive power of the wireless message at the apparatus is above the receive power threshold value.

In an example embodiment of the invention, the method further comprises:

wherein the wireless message includes one or more service level related threshold values including BSS Load threshold, BSS Average Access Delay threshold, BSS Available Admission Capacity threshold, BSS AC Delay threshold, or Extended BSS Load Element threshold and the condition for response is that the BSS Load, BSS Average

Access Delay, BSS Available Admission Capacity, BSS AC Delay, or Extended BSS Load Element of the apparatus is below the respective threshold value; and

5 determining by the apparatus that it can satisfy the at least one condition that the apparatus is below the respective threshold value.

In an example embodiment of the invention, the method further comprises:

wherein the wireless message includes a specification of one or more types of selected responses from the apparatus, including a control frame, a short probe response, a measurement pilot or a beacon frame; and

10 determining by the apparatus that it can satisfy the at least one condition that the apparatus has the specified identity and that the apparatus can respond with the selected response.

In an example embodiment of the invention, the method further comprises:

forwarding the response to another wireless device.

15 In an example embodiment a fifth aspect of the present invention, an apparatus is provided. The apparatus comprises:

at least one processor;

at least one memory including computer program code;

20 the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:

receiving by an apparatus, a wireless message from a sending device, including at least one condition for response from the apparatus, the condition for response including at least one of receive power of the wireless message at the apparatus, service level of the apparatus, or identity of the apparatus and that the apparatus can respond with a selected
25 response;

determining by the apparatus that it can satisfy the at least one condition; and transmitting a response by the apparatus.

In an example embodiment of the invention, the apparatus further comprises:

wherein the response is transmitted as an omnidirectional transmission.

30 In an example embodiment a sixth aspect of the present invention, a computer program product is provided. The computer program product comprising comprises computer executable program code recorded on a computer readable, non-transitory storage medium, the computer executable program code, when executed by a computer processor, comprising:

code for receiving by an apparatus, a wireless message from a sending device,
including at least one condition for response from the apparatus, the condition for response