[0001] # SEAMLESS CHANNEL CHANGE IN A WIRELESS LOCAL AREA NETWORK

[0002] ## FIELD OF INVENTION

[0003] The present invention generally relates to a wireless local area network (WLAN), and more particularly relates to a method for seamless channel change in a WLAN.

[0004] ## BACKGROUND

[0005] In a WLAN system operating in infrastructure mode, an access point (AP) associated to a basic service set (BSS) typically has one or more stations (STAs) associated with it. The AP and its associated STAs communicate with each other by sending and receiving packets over a given channel. When this channel is congested (i.e., the offered traffic on the channel is high), it can be desirable for the nodes of the BSS to use a less-congested channel. Similarly, if the channel is affected by interference external to the system, which is not uncommon in unlicensed bands, it may also be desirable and even necessary for the nodes of the BSS to use a different channel.

[0006] The typical way by which BSSs change channels is for the AP to change the channel on which it transmits all of its frames (management, control, and data) at a specific instant. This means that a STA would suddenly stop receiving any frames from its AP and would see all the frames it sends to the AP remain unacknowledged. For Quality-of-Service (QoS)-sensitive services, this service discontinuity translates into unsatisfied users.

[0007] An amendment (IEEE 802.11h) was made to the WLAN Medium Access Control (MAC) and Physical Layer (PHY) specifications in order to satisfy regulatory requirements for operation in the 5 GHz band in Europe. The amendment is meant to allow WLAN systems in the 5GHz band to co-exist with radar systems, but it does not provide the means by which channel changes can be performed in a manner that is seamless to the end-users and that ensures efficient use of the radio resources. The family of 802.11 standards does not

provide any form of hand-shaking that ensures a seamless channel change when the AP or the STA decides to change its channel.

[0008] For a system operating in infrastructure mode, the 802.11h specification includes a notification message allowing the AP to notify the STA that it will be switching channels in the future. Three options allow the notification to qualify, at a high level, when the channel switch will occur. It is noted that the prior art does not provide any mechanisms for the following:

[0009] 1) The STA to request the AP to change the channel.

[0010] 2) The STA to acknowledge that it has received the notification from the AP and that it will follow the AP to the new channel. In 802.11h, the notification is performed using a broadcast, so the AP does not receive any acknowledgement (ACK) allowing it to determine if the STA will follow it to the new channel or if the STA correctly received the notification. This can create a situation where an AP needlessly transmits and retransmits frames to a STA that did not follow the AP to the new channel. The number of frames buffered in the AP can be substantial and could lead to a dramatic inefficiency of the wireless medium due to the exponentially increasing back off window associated with multiple retransmissions.

[0011] 3) The STA to acknowledge that it has followed the AP to the new channel. This can create a similar inefficiency situation as described above.

[0012] Accordingly, a need exists for a method and apparatus for seamless channel change in a WLAN.

[0013] SUMMARY

[0014] The present invention addresses the limitations of the prior art, thus allowing a seamless channel change in a WLAN without service interruption and without dramatic reduction of the efficiency of the wireless medium.

[0015] A method for seamless channel change in a WLAN having a STA and an AP begins by sending a channel change intention message from the AP to the STA. A channel change response message is sent from the STA to the AP,

informing the AP whether or not the STA will follow the channel change. The AP determines whether to proceed with the channel change, and performs the channel change if the determination is positive.

[0016] Another method for seamless channel change in a WLAN having a STA and an AP begins by sending a channel change request message from the STA to the AP. A determination is made whether the channel change can be performed, and the channel change is performed based on the determination.

[0017] An optional additional step for both of these methods includes sending a channel change executed message from the STA to the AP upon successful execution of the channel change.

[0018] A system for performing a seamless channel change in a wireless local area network includes an AP and a STA. The AP is configured to send a channel change intention message to the STA. The STA is configured to send a channel change response message to the AP, including an indication whether the STA will follow the AP to a new channel. After receiving the channel change response message, the AP is further configured to determine whether or not it will proceed with the channel change and to perform the channel change if the determination is positive. Although the AP will consider the response message from the STA, the decision whether to proceed with the channel change does not need to be in accordance with the response message.

[0019] Another embodiment of a system for performing a seamless channel change in a WLAN includes an AP and a STA. The STA is configured to send a channel change request message to the AP. In the case where the AP only supports one STA, the AP is configured to determine whether the channel change can be performed, and to perform the channel change based on the determination. In the case where the AP supports more than one STA, the AP is configured to initiate the channel change procedure via the channel change intention message, as described above.

[0020] A system for performing a seamless channel change in a WLAN includes an AP and a STA. The AP includes a first channel change notification device; a first channel change determining device connected to the first channel

change notification device; a first channel change device connected to the first channel change determining device; a measurement request device connected to the first channel change determining device; a first transmitter/receiver connected to the first channel change notification device, the first channel change device, and the measurement request device; and a first antenna connected to the first transmitter/receiver. The STA includes a second channel change notification device; a second channel change determining device connected to the second channel change notification device; a station capability device connected to the second channel change determining device; a second channel change device connected to the second channel change determining device; a second transmitter/receiver connected to the second channel change notification device and the second channel change device; a measurement reporting device connected to the second transmitter/receiver; and a second antenna connected to the second transmitter/receiver.

[0021] BRIEF DESCRIPTION OF THE DRAWINGS

[0022] A more detailed understanding of the invention may be had from the following description of a preferred embodiment, given by way of example, and to be understood in conjunction with the accompanying drawings, wherein:

[0023] Figure 1 is a flowchart of a method for seamless channel change initiated by an AP;

[0024] Figure 2 is a signal flow diagram of the method shown in Figure 1;

[0025] Figure 3 is a flowchart of a method for seamless channel change initiated by a STA; and

[0026] Figure 4 is a diagram of a system configured to implement a seamless channel change.

[0027] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Hereafter, the term "station" (STA) includes, but is not limited to, a wireless transmit/receive unit, a user equipment, a fixed or mobile subscriber unit, a pager, or any other type of device capable of operating in a wireless

environment. When referred to hereafter, the term "access point" (AP) includes, but is not limited to, a base station, a Node B, a site controller, or any other type of interfacing device in a wireless environment.

[0029] The present invention solves the problem described above by setting up a hand-shaking procedure between an AP and a STA in which the AP communicates to its associated STAs its intention to switch channels and by which the STA acknowledges that it will or will not follow the AP on the new channel. This procedure ensures that all STAs are aware of the AP's intention to change the channel and that the AP is aware of which STAs are able to follow to the new channel and which STAs would have followed to the new channel had the AP decided to go forward with the channel change. The present invention also solves the problem by allowing the STA to request a channel change, thus triggering the hand-shaking procedure.

[0030] The AP initiated hand-shaking procedure 100 of the present invention is illustrated in Figure 1. For purposes of simplifying the drawings and the discussion of the invention, the following description only refers to a single STA. The principles of the present invention can be equally applied to a system which has multiple STAs.

[0031] An AP sends a STA a channel change intention message indicating its intention to change its channel to channel X, where X represents a channel identifier (step 102). The message also contains information relative to the timing of the channel change. This message can be sent using a broadcast frame or a unicast frame. The advantage of using a broadcast frame is that it limits the number of messages sent over the wireless medium when multiple STAs are associated to the AP. The advantage of using a unicast frame (one for each associated STA) is that it tends to increase the robustness of the signaling, since the AP expects a MAC ACK from the STA indicating whether or not the STA has correctly received the message. In the case where no ACK is received from a certain STA, the AP can re-send the channel change intention message.

[0032] Upon reception of the channel change intention message, the STA determines if it will change its channel to the new channel based on its

capabilities, the radio frequency environment it perceives from its location, and the availability and load of other APs in the system (step 104). This determination involves a multiple criteria decision-making process. For example, the first criterion the STA could consider is whether it has the capabilities (considering hardware and configuration limitations) to change to channel X, as announced in the channel change intention message sent by the AP. The second and third criteria the STA is likely to consider include the level of interference and load the STA perceives on channel X. Based on such criteria, the STA decides whether the channel change is desirable or not. This conclusion can be reached using any form of multiple criteria analysis that compares scores obtained from a weight-based calculation against predetermined levels.

[0033] Once the decision is made, the STA sends a channel change response message which includes a notification that the message was received (applicable in the case where the channel change intention message is sent using a broadcast), and an indication as to whether or not the STA will follow the AP to its new channel (step 106).

[0034] The indication in the channel change response message contains various pre-defined responses including, but not limited to:

[0035] 1) The STA will follow the AP to the new channel.

[0036] 2) The STA will not follow to the new channel and would like to continue to be served by the AP on the same channel. This situation could arise if the STA's scanning indicates that the new channel will degrade its performance, if the STA lacks the capabilities to change channels, or if the STA determines that changing the channel will not allow it to satisfy the QoS requirements of the user's application.

[0037] 3) The STA will not follow the AP to the new channel but does not request the AP to stay on the same channel. This situation could arise if the STA has identified another candidate AP which it determines can offer better performance than the current AP on the new channel.

[0038] The range of techniques by which a STA could perform the channel change determination include using measured or reported quality metrics (e.g.,

signal to noise ratio (SNR), signal to interference and noise ratio (SINR), packet error rate (PER), etc.) on the new channel and comparing these metrics to quality metrics measured on the current channel or to predetermined levels. The STA could also use measured or reported load metrics (e.g., channel occupancy, medium access delay, etc.) on the new channel and compare them to load metrics measured on the current channel or to predetermined levels. It is also possible to use weight-based combinations of several of the above metrics obtained on the new channel, to be compared against the same metrics obtained on the current channel or against predetermined levels.

[0039] If the AP sends its channel change intention message using a broadcast, the channel change response message sent by the STA will also serve the purpose of acknowledging the reception of the channel change intention message. There are some advantages in sending the channel change intention message as a unicast message (which commands for an ACK), since it allows the AP to discriminate between a STA that did not receive the channel change intention message and a STA that received the channel change intention message but did not send the channel change response message. The AP waits for all responses from all STAs (positive or negative) or until a timeout occurs, and then makes the decision whether it will go forward or not with the channel change. The AP is not bound to do what the STA suggested.

[0040] Based on the channel change response notification received from the STA, the AP then makes a decision whether it is going to change the channel or not (step 108). This step allows the AP to reconsider its intention to change the channel. For example, in the case where the AP only serves a single STA and this STA indicates that it cannot follow the AP to the new channel, the AP might decide not to perform the channel change. This is also an opportunity for the AP to request measurements from the STAs if it believes that measurement reports will help it to make a better decision.

[0041] In general, the determination of whether or not the AP will go forward with the channel change is based on the relative number of users that have responded with each type of channel change message versus the foreseen

impact on quality of service of not performing the channel change. A decision making process which compares the relative number of responses of each type against targets that vary according to the foreseen performance gain of switching the channel is one of several potential implementations.

[0042] If the AP decides not to change channels, the procedure 100 terminates (step 110). In the event that the AP decides to go forward with the channel change (step 108), it then sends a channel change notification message to the associated STA (step 112). The message also contains information relative to the timing of the channel change. This message can be sent using a broadcast frame or a unicast frame, with the advantages of each type of frame being the same as described above.

[0043] If the AP decides to go forward with the channel change, it can use the information contained in the channel change response message received from the STA and remove all the buffered packets dedicated to the STA that responded that it would not follow the AP to the new channel. This prevents the AP from wasting a considerable amount of bandwidth by unsuccessfully transmitting packets to the STA if it has not followed the AP to the new channel. The AP changes to the new channel (step 114) and the STA changes to the new channel if it is following the AP (step 116).

[0044] An optional step for the hand-shaking procedure is to have the STA send the AP a channel change executed message after it has changed the channel (step 118). This information could also be used to prevent the AP from wasting bandwidth by unsuccessfully transmitting packets to a STA that would have indicated (in its channel change response message) that it would follow the AP to the new channel but that would have failed to do so. The procedure then terminates (step 110).

[0045] Figure 2 is a signal diagram of a system 200 executing the procedure shown in Figure 1. The system 200 includes an AP 202 and a STA 204. The AP 202 sends a channel change intention message 210, which can be sent as a broadcast or as a unicast. The STA 204 (or each STA 204 if the AP 202 has multiple STAs associated to it) responds to the intention message 210 by sending

a channel change response message 212 to the AP 202. Each STA 204 sends its response message as a unicast message.

[0046] If the channel change is going to occur, the AP 202 sends a channel change notification message 214 to the STA 204. As with the intention message 210, the notification message 214 can be sent as a broadcast or a unicast message. As an optional last message, the STA 204 can send a channel change executed message 216 to the AP 202 upon a successful channel change.

[0047] A method 300 in accordance with the present invention by which a STA requests the AP to change its channel is shown in Figure 3. In a preferred embodiment, the present invention enables the STA to request the AP to change the channel it uses. The need for such a request may arise when the interference or channel activity perceived by the STA is such that it jeopardizes the QoS perceived by its user.

[0048] The STA sends a change channel request message as a unicast frame to its AP (step 302). The message can include some or all of the following information: time limit for performing the channel change, list of preferred channels on which to migrate to, and interference or noise level measurements on the current and candidate channels.

[0049] Upon reception of this message, the AP can then take one of two actions. If the AP has multiple STAs associated to it, it could perform the AP initiated hand-shaking procedure 100, beginning at step 102. If the AP only has a single STA associated with it, it could decide to go forward with the channel change procedure, and perform the procedure 100 beginning at step 108.

[0050] At any point in the flow of events described in Figure 1, the AP can take measurements on the current and proposed channels and/or ask for measurements from the STA requesting the channel change.

[0051] Figure 4 is a diagram of a system 400 configured to implement a seamless channel change. The system 400 includes an AP 402 and a STA 404. The AP 402 includes a channel change notification device 410 and a channel change determining device 412 connected to the channel change notification device 410. A channel change device 414 is connected to the channel change

determining device 412. A measurement request device 416 is connected to the channel change determining device 412. A transmitter/receiver 418 is connected to the channel change notification device 410, the channel change device 414, and the measurement request device 416. An antenna 420 is connected to the transmitter/receiver 418.

[0052] The STA 404 includes a channel change notification device 430 and a channel change determining device 432 connected to the channel change notification device 430. A STA capability device 434 is connected to the channel change determining device 432. A channel change device 436 is connected to the channel change determining device 432. A transmitter/receiver 438 is connected to the channel change notification device 430 and the channel change device 436. A measurement reporting device 440 is connected to the transmitter/receiver 438. An antenna 442 is connected to the transmitter/receiver 438.

[0053] The system 400 operates as follows. The channel change notification device 410 in the AP 402 sends the channel change intention message to the STA 404, where it is processed by the channel change notification device 430. In the event of a STA-initiated channel change request, the channel change notification device 430 in the STA 402 first sends the channel change request message to the AP 402, where it is processed by the channel change notification device 410.

[0054] After receiving the channel change intention message at the STA 404, the channel change determining device 432 in the STA 404 determines whether the STA will change its channel. The channel change determining device 432 accesses information stored in the STA capability device 434 to assist in making this determination. Once the channel change determining device 432 has made the decision regarding the channel change, it signals the channel change notification device 430, which communicates the decision (via the channel change response message) to the channel change notification device 410 in the AP 402. If the STA 404 is going to change its channel, the channel change determining device 432 signals the channel change device 436 to change the channel.

[0055] In the AP 402, the channel change determining device 412 is used to determine whether the AP will change its channel. As noted above, this decision

may be influenced by the channel change response message received from the STA 404. In making this decision, the channel change determining device 412 may request measurements from the STA 404, which is done via the measurement request device 416. Upon receiving a measurement request from the AP 402, the STA 404 gathers the appropriate measurements and reports back to the AP 402 via the measurement reporting device 440. If the AP 402 is going to change its channel, the channel change determining device 412 signals the channel change device 414 to change the channel.

[0056] Embodiments

[0057] A method for seamless channel change in a WLAN having a STA and an AP includes the steps of: sending a channel change intention message from the AP to the STA; sending a channel change response message from the STA to the AP, informing the AP whether the STA will follow the channel change; determining at the AP whether to proceed with the channel change; and performing a channel change if the determination is positive.

[0058] The method according to the preceding paragraph, wherein the channel change response message includes an acknowledgement that the channel change intention message was received.

[0059] The method according to one of the preceding two paragraphs, wherein the performing step includes the steps of: sending a channel change notification message from the AP to the STA; changing the channel at the AP and at the STA; and sending a channel change executed message from the STA to the AP upon successful execution of the channel change.

[0060] The method according to one of the preceding three paragraphs, wherein the WLAN includes more than one STA and the performing step considers the number of STAs that can change channels prior to executing the channel change.

[0061] A method for seamless channel change in a WLAN having a STA and an AP including the steps of: sending a channel change request message

from the STA to the AP; determining whether the channel change can be performed; and performing the channel change based on the determination.

[0062] The method according to the preceding paragraph, wherein the WLAN includes only one STA and the determining step includes the steps of: deciding whether the channel change will be performed by the AP; sending a channel change notification message from the AP to the STA if the channel change is to be performed; and changing the channel at the AP and at the STA.

[0063] The method according to one of the preceding two paragraphs, further including the step of sending a channel change executed message from the STA to the AP if the channel change has been successfully completed.

[0064] The method according to one of the preceding three paragraphs, wherein the WLAN includes more than one STA and the determining step includes the steps of: sending a channel change intention message from the AP to each STA; deciding whether the channel change can be supported by each STA; sending a channel change response message from each STA to the AP; deciding whether the channel change will be performed by the AP; sending a channel change notification message from the AP to each STA if the channel change is to be performed; and changing the channel at the AP and at each STA.

[0065] The method according to one of the preceding four paragraphs, further including the step of sending a channel change executed message from each STA to the AP if the channel change has been successfully completed.

[0066] A system for performing a seamless channel change in a WLAN includes an AP and a STA. The AP is configured to send a channel change intention message to the STA. The STA is configured to send a channel change response message to the AP, the channel change response message including an indication whether the STA will follow the AP to a new channel. The AP is further configured to determine whether to change its channel after receiving the channel change response message and to change its channel if the determination is positive.

[0067] The system according to the preceding paragraph, wherein the channel change response message includes an acknowledgement that the channel change intention message was received by the STA.

[0068] The system according to one of the preceding two paragraphs, wherein if the AP determines to change its channel, then the AP is further configured to send a channel change notification message to the STA and to change its channel, and the STA is further configured to change its channel and to send a channel change executed message to the AP upon successful execution of the channel change.

[0069] The system according to one of the preceding three paragraphs, wherein the WLAN includes more than one STA and the AP considers the number of STAs that can change channels prior to executing the channel change.

[0070] A system for performing a seamless channel change in a WLAN includes an AP and a STA. The STA is configured to send a channel change request message to the AP. The AP is configured to determine whether the channel change can be performed and to perform the channel change based on the determination.

[0071] The system according to the preceding paragraph, wherein the WLAN includes only one STA; the AP sends a channel change notification message to the STA if the channel change is to be performed; the AP is configured to change its channel; and the STA is configured to change its channel.

[0072] The system according to one of the preceding two paragraphs, wherein the STA is further configured to send a channel change executed message to the AP if the channel change has been successfully completed.

[0073] The system according to one of the preceding three paragraphs, wherein the WLAN includes more than one STA; the AP is configured to send a channel change intention message to each STA; each STA is configured to determine whether the channel change can be supported and to send a channel change response message to the AP; the AP is configured to determine whether the channel change will be performed, to send a channel change notification

message to each STA if the channel change will be performed, and to change its channel; and each STA is configured to change its channel.

[0074] The system according to one of the preceding four paragraphs, wherein each STA is further configured to send a channel change executed message to the AP if the channel change has been successfully completed.

[0075] A system for performing a seamless channel change in a WLAN includes an AP and a STA. The AP includes a first channel change notification device; a first channel change determining device connected to the first channel change notification device; a first channel change device connected to the first channel change determining device; a measurement request device connected to the first channel change determining device; a first transmitter/receiver connected to the first channel change notification device, the first channel change device, and the measurement request device; and a first antenna connected to the first transmitter/receiver. The STA includes a second channel change notification device; a second channel change determining device connected to the second channel change notification device; a station capability device connected to the second channel change determining device; a second channel change device connected to the second channel change determining device; a second transmitter/receiver connected to the second channel change notification device and the second channel change device; a measurement reporting device connected to the second transmitter/receiver; and a second antenna connected to the second transmitter/receiver.

[0076] The system according to the preceding paragraph, wherein the first channel change notification device in the AP is configured to send a channel change intention message to the station.

[0077] The system according to one of the preceding two paragraphs, wherein the second channel change notification device in the station is configured to receive the channel change intention message.

[0078] The system according to one of the preceding three paragraphs, wherein the second channel change notification device in the station is configured to send a channel change request message to the AP.

[0079] The system according to one of the preceding four paragraphs, wherein the first channel change notification device in the AP is configured to receive the channel change request message.

[0080] The system according to one of the preceding five paragraphs, wherein the first channel change determining device in the AP is configured to determine whether the AP will change its transmission channel.

[0081] The system according to one of the preceding six paragraphs, wherein if the AP will change its transmission channel, the first channel change determining device signals the first channel change device to change the transmission channel.

[0082] The system according to one of the preceding seven paragraphs, wherein the first channel change determining device in the AP signals the measurement request device to request measurements from the station.

[0083] The system according to one of the preceding eight paragraphs, wherein the measurement reporting device is configured to gather measurements and report the measurements to the AP.

[0084] The system according to one of the preceding nine paragraphs, wherein the second channel change determining device in the station is configured to determine whether the station will change its reception channel.

[0085] The system according to one of the preceding ten paragraphs, wherein if the station will change its reception channel, the second channel change determining device signals the second channel change device to change the reception channel.

[0086] Exemplary applications of the present invention include the areas of load balancing and dynamic channel selection. In these applications, it is desirable for the AP to change its channel in order to adapt to time-varying load and interference conditions. The present invention allows for such channel changes to be performed with minimal service interruption for associated STAs.

[0087] Although the features and elements of the present invention are described in the preferred embodiments in particular combinations, each feature or element can be used alone (without the other features and elements of the

preferred embodiments) or in various combinations with or without other features and elements of the present invention. While specific embodiments of the present invention have been shown and described, many modifications and variations could be made by one skilled in the art without departing from the scope of the invention. The above description serves to illustrate and not limit the particular invention in any way.

* * *

CLAIMS

What is claimed is:

1. A method for seamless channel change in a wireless local area network (WLAN) having a station (STA) and an access point (AP), the method comprising the steps of:

sending a channel change intention message from the AP to the STA;

sending a channel change response message from the STA to the AP, informing the AP whether the STA will follow the channel change;

determining at the AP whether to proceed with the channel change; and

performing a channel change if the determination is positive.

2. The method according to claim 1, wherein the channel change response message includes an acknowledgement that the channel change intention message was received.

3. The method according to claim 1, wherein the performing step includes:

sending a channel change notification message from the AP to the STA;

changing the channel at the AP and at the STA; and

sending a channel change executed message from the STA to the AP upon successful execution of the channel change.

4. The method according to claim 1, wherein the WLAN includes more than one STA and the performing step considers the number of STAs that can change channels prior to executing the channel change.

5. A method for seamless channel change in a wireless local area network (WLAN) having a station (STA) and an access point (AP), the method comprising the steps of:

sending a channel change request message from the STA to the AP;

determining whether the channel change can be performed; and

performing the channel change based on the determination.

6. The method according to claim 5, wherein the WLAN includes only one STA and the determining step includes:

deciding whether the channel change will be performed by the AP;

sending a channel change notification message from the AP to the STA if the channel change is to be performed; and

changing the channel at the AP and at the STA.

7. The method according to claim 6, further comprising the step of:

sending a channel change executed message from the STA to the AP if the channel change has been successfully completed.

8. The method according to claim 5, wherein the WLAN includes more than one STA and the determining step includes

sending a channel change intention message from the AP to each STA;

deciding whether the channel change can be supported by each STA;

sending a channel change response message from each STA to the AP;

deciding whether the channel change will be performed by the AP;

sending a channel change notification message from the AP to each STA if the channel change is to be performed; and

changing the channel at the AP and at each STA.

9. The method according to claim 8, further comprising the step of:

sending a channel change executed message from each STA to the AP if the channel change has been successfully completed.

10. A system for performing a seamless channel change in a wireless local area network (WLAN), comprising:

an access point (AP);

a station (STA);

said AP configured to send a channel change intention message to said STA;

said STA configured to send a channel change response message to said AP, said channel change response message including an indication whether said STA will follow said AP to a new channel; and

said AP configured to determine whether to change its channel after receiving said channel change response message and to change its channel if the determination is positive.

11. The system according to claim 10, wherein said channel change response message includes an acknowledgement that said channel change intention message was received by said STA.

12. The system according to claim 10, wherein if said AP determines to change its channel, then:

said AP is further configured to send a channel change notification message to said STA and to change its channel; and

said STA is further configured to change its channel and to send a channel change executed message to said AP upon successful execution of the channel change.

13. The system according to claim 10, wherein the WLAN includes more than one STA and said AP considers the number of STAs that can change channels prior to executing the channel change.

14. A system for performing a seamless channel change in a wireless local area network (WLAN), comprising:

an access point (AP);

a station (STA);

said STA configured to send a channel change request message to said AP; and

said AP configured to determine whether the channel change can be performed and to perform the channel change based on the determination.

15. The system according to claim 14, wherein

the WLAN includes only one STA;

said AP sends a channel change notification message to said STA if the channel change is to be performed;

said AP is configured to change its channel; and

said STA is configured to change its channel.

16. The system according to claim 15, wherein said STA is further configured to send a channel change executed message to said AP if the channel change has been successfully completed.

17. The system according to claim 14, wherein

the WLAN includes more than one STA;

said AP is configured to send a channel change intention message to each STA;

each STA is configured to determine whether the channel change can be supported and to send a channel change response message to said AP;

said AP is configured to determine whether the channel change will be performed, to send a channel change notification message to each STA if the channel change will be performed, and to change its channel; and

each STA is configured to change its channel.

18. The system according to claim 17, wherein each STA is further configured to send a channel change executed message to said AP if the channel change has been successfully completed.

19. A system for performing a seamless channel change in a wireless local area network, comprising:

an access point (AP), comprising:

a first channel change notification device;

a first channel change determining device connected to said first channel change notification device;

a first channel change device connected to said first channel change determining device;

a measurement request device connected to said first channel change determining device;

a first transmitter/receiver connected to said first channel change notification device, said first channel change device, and said measurement request device; and

a first antenna connected to said first transmitter/receiver; and

a station, comprising:

a second channel change notification device;

a second channel change determining device connected to said second channel change notification device;

a station capability device connected to said second channel change determining device;

a second channel change device connected to said second channel change determining device;

a second transmitter/receiver connected to said second channel change notification device and said second channel change device;

a measurement reporting device connected to said second transmitter/receiver; and

a second antenna connected to said second transmitter/receiver.

20. The system according to claim 19, wherein said first channel change notification device in said AP is configured to send a channel change intention message to said station.

21. The system according to claim 20, wherein said second channel change notification device in said station is configured to receive the channel change intention message.

22. The system according to claims 19 or 20, wherein said second channel change notification device in said station is configured to send a channel change request message to said AP.

23. The system according to claim 22, wherein said first channel change notification device in said AP is configured to receive the channel change request message.

24. The system according to claims 19, 20, or 22, wherein said first channel change determining device in said AP is configured to determine whether said AP will change its transmission channel.

25. The system according to claim 24, wherein if said AP will change its transmission channel, said first channel change determining device signals said first channel change device to change the transmission channel.

26. The system according to claims 19, 20, 22, or 24, wherein said first channel change determining device in said AP signals said measurement request device to request measurements from said station.

27. The system according to claims 19, 20, 22, 24, or 26, wherein said measurement reporting device is configured to gather measurements and report the measurements to said AP.

28. The system according to claim 19, 20, 22, 24, or 26, wherein said second channel change determining device in said station is configured to determine whether said station will change its reception channel.

29. The system according to claim 28, wherein if said station will change its reception channel, said second channel change determining device signals said second channel change device to change the reception channel.