Method and Apparatus for Network Constructing, and Device Including the Apparatus

Technical field

[0001] The invention relates to the field concerning network and communication, specifically to a method and apparatus for network constructing, and device including the apparatus.

Background Art of the Invention

[0002] Traditionally, creating procedure of network and related information in a system are hidden from a user. For example, a normal ZigBee commissioning procedure hides the creation of ZigBee network from the user, and forming or joining a network are implemented by means of user actions. Therefore, understanding of the networking concept and proper configuration of the network are left to the user. Under the condition that the decision to join an existing network or form a new network is made automatically by a device, during network construction, a mis-configuration may occur due to misoperation of an administrator and/or a user of the network and/or limits of the system per se. To address the issue, the user has to first identify the occurrence of the issue and then perform related actions to fix it.

Summary of the Invention

[0003] In view of the above defects existing in the prior art, an object of the invention is to provide a method and apparatus for network constructing, and device including the apparatus to overcome at least the problem that the network mis-configuration shall be removed with intervention of the administrator and/or the user of the network according to current networking technique.

[0004] An embodiment of the invention is a networking method comprising: in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, removing the network

mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

[0005] Another embodiment of the invention is an apparatus which is configured to, in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, remove the network mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

[0006] Another embodiment of the invention is a device having the function for network constructing, which is configured to include the above apparatus for network constructing.

[0007] Still another embodiment of the invention provides a program product stored thereon machine readable instruction codes which can execute the method for network constructing according to the embodiment of the invention when read and executed by a machine.

[0008] Still another embodiment of the invention provides a storage medium carrying the above program product.

[0009] By means of the networking technique according to the embodiments of the invention described above, at least one of the following advantages can be achieved: in case of lack of knowledge or operations of the user, removing accidental mis-configuration by detection and actions of the device per se without intervention of the administrator and/or the user of the network environment; enabling the user to use the device more easily; deleting an invalid network which occupies network resources by revoking network mis-configuration during networking, thereby saving network resources and improving utilizing efficiency of the network resources.

Brief Description of the Drawings

[0010] Figure 1A is a schematic view illustrating a newly formed ZigBee wireless

network including only one light.

[0011] Figure 1B is a schematic view illustrating a newly formed ZigBee wireless network including only two lights.

[0012] Figure 2 is a flow chart of applying the method for network constructing according to an embodiment of the invention in the case of a network mis-configuration caused by misoperation of a user.

[0013] Figure 3 is a flow chart of applying the method for network constructing according to an embodiment of the invention in the case of another network mis-configuration caused by misoperation of a user.

[0014] Figure 4 is a schematic view only illustrating a structure of a specific implementation of the apparatus for network constructing according to an embodiment of the invention.

[0015] Figure 5 is a schematic view illustrating structure of a specific example of a mis-configuration removing unit 420 shown in Figure 4.

Detailed Description of the Embodiments

[0016] Embodiments of the invention are explained with reference to the accompanying drawings hereinafter. It should be noted that representations and descriptions of components and processes unrelated to the invention and known to those of ordinary skilled in the art are omitted here for the purpose of clearness.

[0017] The method for network constructing according to an embodiment of the invention comprises: in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, removing the network mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

[0018] Here, the device associated with the network mis-configuration refers to the device configured incorrectly during the network construction, that is, the device not achieving its configuration goal due to occurrence of the network mis-configuration.

[0019] As is known, some wrong configurations contrary to the configuration goal, that is, network mis-configurations, may occur during configuring a device with respect to the network environment. The network mis-configurations may include, for example, a situation in which a device that should have joined the existing network did not join the existing network. For example, under the condition that there is one network and the network can permit other devices to join, if the configuration object is to make a new device join the network, the device is conventionally made to search for the network, and then the device can join the network after the network is found by the device. However, there may be a case that the network is not found by the new device, such that the new device cannot join the network, and thus the network mis-configuration occurs. For the sake of convenient description, such mis-configuration is referred to as "first type of mis-configuration" hereinafter. Here, in the first type of mis-configuration, the new device fails to achieve the goal of joining the existing network because of the occurrence of the network mis-configuration. The new device mentioned here refers to the device associated with the network mis-configuration mentioned above.

[0020] The network mis-configuration may be caused by misoperation of the user and/or limits of the system per se.

[0021] Here, misoperation of the user includes, for example, the operation of not performing the network configuration in a correct order. For example, a user intends to add a new device to an existing network, and the user should have performed the configuration in the following order: firstly configuring the existing network to enable it to be found by devices outside the network and permit joining of the devices outside the network, then making the new device start searching for the network. However, the user makes the new device search for the network directly without performing the above configuration operation for the existing network. In this case, the device cannot find the above network. Therefore, the above misoperation of the user causes a network mis-configuration.

[0022] Taking the ZigBee wireless network system as an example. If the configuration goal of the user is to add a new ZigBee device to the ZigBee wireless network system, then the user needs to perform the network configuration in the following order: firstly

pressing the Setup button of a device in the ZigBee wireless network to enable the ZigBee wireless network to be found by other devices and permit joining of other devices; then pressing the Setup button of the new ZigBee device to make it start search for the network. If the user does not configure the network in the above order, for example, the user presses the Setup button of the new ZigBee device in without having firstly pressed the Setup button of any device in the ZigBee wireless network system, the ZigBee device would not find the above ZigBee wireless network, leading to the network mis-configuration.

[0023] In addition, some limits of the system per se may also cause the network mis-configuration. For example, in the case of coexistence of at least two networks on the same physical communication medium, when the user attempts to add a new device in one network, the device may not find the network that it can join due to mutual interference among the networks, such that the device can not join the network to be joined, and the network mis-configuration occurs. As another example, although there is only one network that the device can join on the physical communication medium, the device may not find the network finally due to poor signal intensity of the network or poor searching ability of the device, and thus unable to join the network.

[0024] Similarly, if the system per se has limits as mentioned above and meanwhile the user operates incorrectly, similar network mis-configurations may also occur.

[0025] In addition, except for the above mentioned case in which the device that should have joined the existing network did not join the existing network, the network mis-configuration may include other situations. For example, at least two devices which should have created one network did not complete the creation of the network. For the sake of convenient description, such mis-configuration is referred to as "second type of mis-configuration" hereinafter. Here, in the second type of mis-configuration, the above at least two devices fail to achieve the goal of creating one network because of the occurrence of the network mis-configuration, and the at least two devices mentioned here refer to devices associated with the network mis-configuration as mentioned above. In this situation, the at least two devices should have formed one new network including the above at least two devices. However, due to various reasons such as misoperation of the administrator and/or the user and/or the

limits of the system per se, for example, at least two networks are created by the above at least two devices, the mis-configuration is caused. When such other type of mis-configuration is present, the method for network constructing according to the embodiment of the invention may also be used to remove the network mis-configuration by actions performed by the device per se, without intervention of the administrator and/or the user of the network environment.

[0026] It can be seen from the above description that the network mis-configuration involved in the embodiment of the invention refers to the mis-configuration generated during the network configuration for the network environment comprising at least two devices. In accordance with different application scenes, the "at least two devices" here refers both to the devices not joining any network and devices present in the existing network, for example, in the case of the first type of mis-configuration, and refers to the devices not joining any network, for example, in the case of the second type of mis-configuration. Of course, it should be understood that the mis-configurations provided here are only some specific examples of the mis-configurations which can be handled by the method for network constructing of the embodiment of the invention, and do not intend to limit the invention. As a matter of fact, other cases similar to the above mentioned types of mis-configuration can also be solved by applying the networking technique according to the embodiment of the invention.

[0027] It should be noted that the expression "intervention of the administrator and/or the user of the network environment" mentioned here refers to the situation in which the administrator and/or the user need to identify what type of network mis-configuration has happened and adopt proper operation initiatively to remove the generated mis-configuration. As described above for the existing technology, if there is a need for the intervention of the administrator and/or the user for removing the mis-configuration, the administrator and/or the user may be overburdened, reducing the degree of user friendliness of the device. Moreover, the utilizing efficiency of network resources is also reduced.

[0028] In a specific implementation of the method for network constructing according to the embodiment of the invention, removing the network mis-configuration by

actions performed by the device per se associated with the network mis-configuration may include: creating a new network by the device when the device finds no existing network that it can join; judging, by the device, whether the new network is invalid according to the configuration information of the new network when the waiting time period of the device during which other devices are permitted to join the new network is interrupted; and revoking configuration information of the device related to the new network when the new network is judged to be invalid.

[0029] Specific examples of the operation for interrupting the waiting time period of the device during which other devices are permitted to join the new network may include the following two manners.

[0030] One manner is that the time interval set by the device for waiting for other devices to join the new network expires. The magnitude of the time interval may be preset based on actual conditions of the application scene.

[0031] The other manner is that the device is triggered by an external signal to stop waiting for other devices to join the new network. For example, under the condition that the time interval set by the device for waiting for other devices to join the new network does not expire, an external signal is inputted to the device by the operation of the user and/or the administrator of the network to trigger the device so that it does not allow other devices to join the newly formed network. For example, if the device is a ZigBee device, the signal may be generated by pressing the Setup button on the device by the user and/or the administrator. It shall be noted here that the external signal is generated by the operation of the user and/or the administrator, but such operation of the user and/or administrator is not made initiatively for removing the network mis-configuration in the case of knowing and identifying the network mis-configuration by the user and/or the administrator, and the operation then is unintentional operation or operation made for achieving other goals with the user and/or the administrator not knowing the network mis-configuration has happened. Therefore, such operation cannot be regarded as the intervention of the user and/or the administrator performed for removing the mis-configuration.

[0032] By interrupting the waiting time period of the device during which other devices are permitted to join the new network, the device can be triggered to judge the validity

of the created new network. In a specific implementation of the method for network constructing according to the embodiment of the invention, the device may invoke the configuration information related to the new network by the following operations when the new network is judged to be invalid: deleting the new network and returning the settings of the device to the factory default or to the settings before the occurrence of the network mis-configuration. An invalid network is usually useless, because it not only occupies communication resources, but also further reduces communication efficiency and rate between related network devices, such as devices in other network on the same communication medium, due to the limit of the communication resources. Therefore, deletion of the invalid new network can save communication resources and improve the communication efficiency and rate. Furthermore, the settings of the device may be optionally returned to the factory default or the settings before the occurrence of the network mis-configuration as required. For example, if there is a need of keeping the record of the mis-configuration for the device, the settings of the device may be returned to the settings before the occurrence of the network mis-configuration.

[0033] As a specific implementation of judging the validity of the newly formed network by the device, for example, the device may judge whether the new network is invalid based on the configuration information of the new network, that is, judge the new network to be invalid when the new network satisfies at least one of the following three conditions.

[0034] The first condition is that the number of the devices in the new network is 1. If the newly formed network has only one device and there is no other device to communicate with this device in the network, then the network is usually of no value. Explanation is provided by taking Figure 1A as an example. Figure 1A is a schematic view illustrating a newly formed ZigBee wireless network including only one light. The light can receive two kinds of signals indicative of being "on" or "off", respectively, but cannot send signal to the outside. Since the number of the devices in the ZigBee wireless network is 1, the ZigBee wireless network is judged to be invalid. Furthermore, the ZigBee wireless network can be deleted, and the settings of the light may be returned to the factory default or to the settings before the occurrence of the network mis-configuration.

[0035] The second condition is that all devices in the new network have no compatibility. If all the devices in the newly formed network are incompatible and they are unable to communicate with each other, then there may be of no value allowing the network to continue to exist. For example, in a network such as a ZigBee wireless network, if any two devices in the network have no matching in/out clusters and hence are not able to send or receive commands between them, it is indicated that the any two devices in the network have no compatibility. An example may be a ZigBee wireless network consisting of a light and a thermostat. The light can be switched on or off but the thermostat can only set a temperature, so they are incompatible and unable to communicate with each other. Therefore, the network in the example may be judged to be invalid. Figure 1B shows another example. Figure 1B is a schematic view illustrating a newly formed ZigBee wireless network including only two lights. In this example, each of light I and light II can only receive and cannot send, and the two lights have no matching in/out clusters and thus are incompatible. The network in this example shall also be judged to be invalid.

[0036] The third condition is that security levels of the devices in the new network are not matched with each other. If a network is created and the devices in the network require different security levels, which means the devices will be unable to operate together, that is, the network is of no value. An example of this may be a wireless network including only two ZigBee devices, one device requires an Application Link Key to communicate while the other device does not support the Application Link Key, that is, security levels between the two devices are not matched, so the two devices still cannot communicate with each other. Such a network is also invalid.

[0037] As to the criterion and method of judging the validity of the network, in addition to those described above, any proper technique including technique already known or to be developed later can be used according to actual conditions, and details of such technique are thus omitted here.

[0038] As described above, the embodiment of the invention provides an automated process implemented by actions of the device per se without operation or involvement of the user and/or the administrator, that is, without intervention of the user and/or the administrator.

[0039] One example of removing the mis-configuration in the case of mis-configuration caused by misoperation of the user is explained in conjunction with Figure 2. The mis-configuration in this example is a specific example of the first type of mis-configuration.

[0040] Figure 2 is a flowchart of a specific example of applying the method for network constructing according to the embodiment of the invention in the case of network mis-configuration generated due to the misoperation of the user.

[0041] As shown in Figure 2, the method for network constructing 200 starts at step S210. At step S220, the user intends to add a new ZigBee device into an existing ZigBee wireless network. However, the user presses the Setup button of the new device without pressing the Setup button of any device in the existing ZigBee wireless network, that is, the user makes the new device search for the network while the ZigBee wireless network cannot be found. Therefore the new device cannot find the ZigBee wireless network at step S230, and then cannot join the network. The mis-configuration thus occurs.

[0042] At step S240, the new device creates a new network automatically, and the network can permit other devices outside the network to find and join. The new device presets a waiting time interval during which the new device waits for other devices to join the network.

[0043] When the waiting time interval expires, the waiting is interrupted, thereby triggering the device, at step S250, to judge whether the new network is invalid using the above described three conditions.

[0044] Specifically, in the example, the application scene is an island network, there are only the above mentioned new device and the ZigBee wireless network and no other networks or devices exist in the environment, or, though there are other devices exist in the environment, the other devices cannot join the new network due to the limits of the system or the limits of the ability of the other devices per se. Thus, no device joins the new network during the above mentioned waiting time interval. Therefore, the new network is judged to be invalid by using only the first condition described above, that is, the new network includes only one device. The new network is thus deleted at step

S260. Moreover, the settings of the new device is returned to factory default. The method for network constructing 200 terminates at step S270.

[0045] Thereafter, the user may try to perform the network configuration again. For example, when the user finds the new device did not join the network that the new device desires to join, the user may possibly press the Setup button of the new device again. Then, the new device searches again the network that it can join. If the user have performed related configurations to the existing ZigBee wireless network that the new device desires to join between pressing the Setup button of the new device by the user for the first time and pressing the Setup button of the new device by the user for the second time, for example, the Setup button of one device in the ZigBee wireless network has been pressed to enable the network to be found by the new device, then the pressing the Setup button of the new device for the second time may enable the new device to find the ZigBee wireless network and join the network. Alternatively, subsequent operation of the user may make the new device create a new network automatically, and the network may permit other devices to join. Anyway, because of removing of the previously generated network mis-configuration, there is an opportunity to perform various normal operations to the new device.

[0046] Another example of removing the mis-configuration in the case of another type of mis-configuration generated due to the misoperation of the user is explained below in conjunction with Figure 3.

[0047] Figure 3 is a flowchart of a specific example of applying the method for network constructing according to the embodiment of the invention in the case of another type of network mis-configuration generated due to the misoperation of the user. The network mis-configuration in this example is a specific example of the above mentioned second type of mis-configuration.

[0048] As shown in Figure 3, the method for network constructing 300 starts at step S310. At step S320, a user intends to create a new network including two new ZigBee devices using the two new ZigBee devices in an environment having no existing network. Then the user presses the Setup button of the first device of the two ZigBee devices. Since there is no network that the first device can join in the environment, the first device plans to create a new network when a network that the first device can join

is not found by the first device, but the creation has not been completed yet.

[0049] At this time, the user should press the Setup button of the second device of the two ZigBee devices after completion of the creation of the new network, so that the second device can find the above new network. However, at step S330, the user presses the Setup button of the second device without waiting for a time period long enough, that is, the time interval between the operation of pressing the Setup buttons of the different devices, i.e. the first device and the second device in this example, by the user is too short, such that the second device cannot find the new network created by the first device at step S340, and thus cannot join the network. The network mis-configuration thus occurs.

[0050] At step S350, the second device creates another new network. In the application scene of the example, there is no device waiting to join a network, or, though there is such a device, the device cannot join the network due to limits of the system or limits of the ability of the device per se. Therefore, the another new network created by the second device only includes the second device per se in the end.

[0051] Then, there are two new networks in the environment, and each new network includes only one device. Similar to the example shown in Figure 2, when time intervals set by the two ZigBee devices for waiting for other devices to join the two new networks expire, or, due to input of external signals, the two ZigBee devices each judges whether the two new networks are invalid using the above prescribed three conditions at step S360. Similar to the judging procedure of the example shown in Figure 2, the two networks each includes only one device, and both of them are judged to be invalid and thus deleted at step S370. The subsequent processes may be similar to the processing procedure in the example shown in Figure 2. The method for network constructing 300 terminates at step S380.

[0052] Therefore, the above network mis-configuration caused by the misoperation of the user may be removed without the intervention of the administrator and/or the user of the network environment, while the network mis-configuration is conventionally dealt with through guidance and operation of the user. Thus, the networking efficiency of the system is significantly improved. Moreover, the utilizing efficiency of the network resources may be enhanced and the operability of the device may be

improved.

[0053] Another embodiment of the invention further provides an apparatus for network constructing which is configured to, in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, remove the network mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

[0054] The network mis-configuration mentioned here may be the same as the network mis-configuration mentioned above in the embodiment of the method for network constructing, and specific descriptions thereof are thus omitted here.

[0055] Figure 4 is a schematic view illustrating the structure of a specific implementation of the apparatus for network constructing according to the embodiment of the invention. As shown in Figure 4, the apparatus for network constructing 400 may include a network creating unit 410 and a mis-configuration removing unit 420. The network creating unit 410 is configured to make the device related to the network mis-configuration create a new network when no existing network that the device can join is found; and the mis-configuration removing unit 420 is configured to judge whether the new network is invalid according to the configuration information of the new network when the waiting time period of the device is interrupted, during which waiting time period other devices are permitted to join the new network. The mis-configuration removing unit 420 revokes configuration information related to the new network if the new network is judged to be invalid.

[0056] Furthermore, the waiting time period of the device during which other devices are permitted to join the new network may be interrupted by any of the two manners mentioned in the preceding embodiment of the method for network constructing. Specific contents of the two manners may be obtained by referring to corresponding descriptions above, and detailed descriptions thereof are thus omitted here.

[0057] Figure 5 is a schematic view illustrating the structure of a specific example of the mis-configuration removing unit 420 shown in Figure 4. As shown in Figure 5, the mis-configuration removing unit 420 may include a new network deleting subunit 510

and a configuration recovering subunit 520. These subunits are configured to revoke the configuration information related to the new network by the following operations when the new network is judged to be invalid. The new network deleting subunit unit 510 deletes the new network, and the configuration recovering subunit 520 returns the settings of the device to the factory default or to the settings before the occurrence of the network mis-configuration.

[0058] In a specific implementation, the mis-configuration removing unit 420 is configured to judge the new network to be invalid when the new network satisfies at least one of the three conditions: the number of the devices in the new network is 1; the devices in the new network have no compatibility; and security levels of the devices in the new network are not matched with each other.

[0059] The above apparatus for network constructing according to the embodiment of the invention and the components included in the apparatus may be configured to execute the method for network constructing described in conjunction with Figures 2 and 3 and can bring out similar technical benefits. More details may be obtained by referring to corresponding descriptions above, and detailed descriptions thereof are thus omitted here.

[0060] In addition, still another embodiment of the invention further provides a device having the function for networking constructing. The device may include the apparatus for network constructing provided in the embodiment of the invention above, and thus can remove already generated various network mis-configurations by the action of the device per se without intervention of the administrator and/or the user of the network environment.

[0061] Here, the device having the function for network constructing may be one of the following: a dimmer, a switch, a curtain controller, a remote controller, a gateway, a sensor or an electrical device configured to include the apparatus for network constructing, such as a refrigerator, a television, a washing machine, or the like.

[0062] It can be seen from the specific descriptions of the embodiments of the invention that, at least one of the following advantages may be obtained by applying the technique for network constructing of the embodiments of the invention (method for

network constructing, apparatus for network constructing and/or device equipped with the apparatus according to the embodiments of the invention) to, for example, a ZigBee wireless network or other similar networks. Specifically, the generated network mis-configuration may be fixed without knowledge or operation of the user and/or the administrator, making the user use the device more easily by detecting and fixing a problem concerning the network mis-configuration by the device automatically, thereby increasing the operability of the device. Traditionally, it is the user's responsibility to detect, understand and fix the problem. When a network is created by applying the device equipped with the apparatus for network constructing and/or the apparatus for network constructing according to the embodiments of the invention, if there occurs a network mis-configuration, the device can automatically find and solve the problem to remove the mis-configuration without the user and/or the administrator realizing there has even been the mis-configuration. Then, the user can attempt repeatedly the old operation or other possible operation. This is even more important when the networking concept is hidden from the user and the decision to form or join a network is made automatically by the device. The utilizing efficiency of the network resources can be improved accordingly. Furthermore, automation of these actions within the device eliminates the need for the user and/or the administrator to understand the network and perform appropriate operation to solve the problem concerning the network mis-configuration. Moreover, application of the technique for network constructing according to the embodiments of the invention in a device or a system enables to make commissioning and usage of the device easier without adding material cost the device, and thus is cost-effective.

[0063] Those of ordinary skilled in the art would understand that, though the above specific descriptions are provided under the ZigBee wireless network environment, the technique for network constructing according to the embodiments of the invention may be applicable to other similar network environments such as Bluetooth, WiFi or Z-wave.

[0064] Those of ordinary skilled in the art would appreciate that the method, apparatus, device for network constructing and the components included therein according to the embodiments of the invention may be executed separately or together by various hardware, software, firmware or any combination thereof. In the case of execution by

software and/or firmware, the software and/or firmware may be loaded to a machine which can read the software and/or firmware to implement the method and apparatus for network constructing according to the embodiments of the invention.

[0065] In addition, another embodiment of the invention further provides a program product stored thereon machine readable instruction codes. The instruction codes can execute the method for network constructing according to the embodiment of the invention when read and executed by a machine. Correspondingly, a storage medium for carrying such program product is also included in the disclosure of the invention, and such storage medium includes, for example, a Disk, a CD-ROM, a magneto-optical disk, a semiconductor memory, etc.

[0066] In the above descriptions of the specific embodiments of the invention, features described and/or illustrated for one implementation may be used in one or more other implementations in the same or similar manner, may be combined with features in other implementations or may replace features in other embodiments.

[0067] It should be emphasized that the technical terms "comprising/including" and "comprise/include" used in the present description refer to existence of a feature, an element, a step or a component, without excluding existence or attachment of one or more other features, elements, steps or components. The terms "first", "second" involving ordinal number do not indicate the significance degree or the implementation order of the feature, element, step or component defined by those terms but identify the feature, element step or component for the sake of clearness.

[0068] In addition, the method according to the embodiments of the invention are not limited to be performed in the time order described in the description or shown in the drawings, and may be performed in other time order in parallel or independently. Therefore, the implementation order described in the description of the invention does not intend to limit the technical scope of the invention.

[0069] Although the invention has been disclosed by describing specific embodiments of the invention above, it should be understood that those of ordinary skilled in the art can design various amendments, improvement or equivalents of the invention within

the spirit and scope of the appended claims. Such amendments, improvements or equivalents shall also be regarded within the scope of protection of the invention.

CLAIMS

1. A method for network constructing, comprising:

in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, removing the network mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

2. The method according to claim 1, wherein, the network mis-configuration includes one of the following:

a device that should have joined an existing network did not join the existing network; and

at least two devices that should have created one network did not complete creation of the network.

3. The method according to claim 2, wherein, said removing the network mis-configuration by an action performed by the device per se associated with the network mis-configuration comprises:

creating, by the device, a new network when the device finds no network that the device can join; and

judging, by the device, whether the new network is invalid based on the configuration information of the new network when a waiting time period of the device during which other devices are permitted to join is interrupted, and revoking configuration information related to the new network in the device when the new network is judged to be invalid.

4. The method according to claim 3, wherein, the waiting time period of the device during which other devices are permitted to join is interrupted in any of the

following manners:

a time interval set by the device for waiting for other devices to join the new network expires; and

the device is triggered by an external signal to stop waiting for other devices to join the new network.

5. The method according to claim 3 or 4, wherein the device revokes the configuration information related to the new network by the following operations when the new network is judged to be invalid:

deleting the new network; and

returning the settings of the device to factory default or to the settings before occurrence of the network mis-configuration.

6. The method according to any of claims 3-5, wherein, said judging, by the device, whether the new network is invalid based on the configuration information of the new network comprises:

judging the new network to be invalid when the new network satisfies at least one of the three conditions:

the number of the devices in the new network is 1;

all devices in the new network have no compatibility; and

security levels of devices in the new network are not matched with each other.

7. The method according to any of claims 1-6, wherein the network mis-configuration is caused by misoperation of the administrator and/or the user of the network environment, and/or by limits of the system per se including an existing network and the device.

8. The method according to any of claims 1-7, wherein, the method is applied in a ZigBee network environment.

9. An apparatus for network constructing configured to, in response to a network mis-configuration generated during network configuration for a network environment including at least two devices, remove the network mis-configuration by an action performed by the device per se associated with the network mis-configuration, without intervention of an administrator and/or a user of the network environment.

10. The apparatus according to claim 9, wherein the network mis-configuration comprises one of the following:

a device that should have joined an existing network did not join the existing network; and

at least two devices that should have created one network did not complete creation of the network.

11. The apparatus according to claim 10, comprising:

a network creating unit configured to make the device related to the network mis-configuration create a new network when the device finds no network that the device can join; and

a mis-configuration removing unit configured to judge whether the new network is invalid based on the configuration information of the new network when a waiting time period of the device during which other devices are permitted to join is interrupted, and revoke configuration information related to the new network in the device when the new network is judged to be invalid.

12. The apparatus according to claim 11, wherein, the waiting time period of the device during which other devices are permitted to join is interrupted in any of the following manners:

a time interval set by the device for waiting for other devices to join the new network expires; and

the device is triggered by an external signal to stop waiting for other devices to join the new network.

13. The apparatus according to claim 11 or 12, wherein the mis-configuration removing unit comprises a new network deleting subunit and a configuration recovering subunit, the two subunits being configured to revoke the configuration information related to the new network by the following operations when the new network is judged to be invalid:

deleting the new network by the new network deleting subunit; and

returning the settings of the device to factory default or to the settings before occurrence of the network mis-configuration by the configuration recovering subunit.

14. The apparatus according to any of claims 11-13, wherein, the mis-configuration removing unit is configured to judge the new network to be invalid when the new network satisfies at least one of the three conditions:

the number of the devices in the new network is 1;

all devices in the new network have no compatibility; and

security levels of devices in the new network are not matched with each other.

15. The apparatus according to any of claims 9-14, wherein, the apparatus is

applied in a ZigBee network environment.

16. A device having the function for network constructing configured to include the apparatus for network constructing according to any of claims 9-15.

17. The device according to claim 16, which is one of the following:

a dimmer, a switch, a curtain controller, a remote controller, a gateway, a sensor or an electrical device including the apparatus for network constructing.

18. A program product stored thereon machine readable instruction codes which can execute the method for network constructing according to any of claims 1-8 when read and executed by a machine.

19. A storage medium carrying the program product according to claim 18.