D-Link®

User Manual

DAP-1610

AC1200 Wi-Fi Range Extender

April 2018

Contents

CHAPTER 1. INTRODUCTION

Contents and Audience

This manual describes the extender DAP-1610 and explains how to configure and operate it.

This manual is intended for users familiar with basic networking concepts, who create an in-home local area network, and system administrators, who install and configure networks in offices.

Conventions

Example	Description
text	The body text of the manual.
Before You Begin	A reference to a chapter or section of this manual.
"Quick Installation Guide"	A reference to a document.
Change	A name of a menu, menu item, control (field, checkbox, drop-down list, button, etc.).
`192.168.0.50`	Data that you should enter in the specified field.
! Information	An important note.

Document Structure

Chapter 1 describes the purpose and structure of the document.

Chapter 2 gives an overview of the extender's hardware and software features, describes its appearance and the package contents.

Chapter 3 explains how to install the extender DAP-1610 and configure a PC in order to access its web-based interface.

Chapter 4 describes all pages of the web-based interface in detail.

Chapter 5 includes safety instructions and tips for networking.

Chapter 6 introduces abbreviations and acronyms used in this manual.

CHAPTER 2. OVERVIEW

General Information

The DAP-1610 device is a wireless extender designed to increase the operational range of your wireless network. The extender supports operation with wireless devices of the standards 802.11a, 802.11b, 802.11g, 802.11n, and 802.11ac (at the wireless connection rate up to 1167Mbps[1]). Simultaneous activity of 2.4GHz band and 5GHz band allows performing a wide range of tasks.

The device supports multiple functions for the wireless interface: several security standards (WEP, WPA/WPA2), MAC address filtering, different operation modes (repeater, client, access point), WPS, WMM.

Smart adjustment of Wi-Fi clients is useful for networks based on several D-Link access points or routers – when the smart adjustment function is configured on each of them, a client always connects to the access point (router, extender) with the highest signal level.

The wireless extender is equipped with one Fast Ethernet LAN port, which can be used to connect a wired client to the extender or to connect DAP-1610 to a wired router.

The LED clearly shows the signal level of the wireless network to which DAP-1610 is connected. Due to this, you can easily find the best location for the extender.

You can configure the settings of the DAP-1610 device via the user-friendly web-based interface (the interface is available in two languages – in Russian and in English).

The configuration wizard allows you to quickly switch the extender to the access point, repeater, or client mode and configure all needed settings for the selected mode in several simple steps.

Now you can simply update the firmware: when the Internet access is provided, the extender itself finds approved firmware on D-Link update server and notifies when ready to install it.

1 Up to 300Mbps for 2.4GHz and up to 867Mbps for 5GHz.

*Specifications**

Hardware	
Processor	· MT7628NN (575/580MHz)
RAM	· 64MB, DDR2
Flash	· 8MB, SPI
Interfaces	· 10/100BASE-TX LAN port
LEDs	· POWER/WPS · Wi-Fi Signal Strength
Buttons	· WPS button to set up wireless connection · RESET button to restore factory default settings
Antenna	· Two external non-detachable antennas (3dBi gain for 2.4GHz and 2dBi gain for 5GHz)
MIMO	· 2 x 2
Power connector	· CEE 7/16 plug for AC power supply

Software	
Network functions	· DHCP server · Automatic obtainment of LAN IP address · DNS relay · Autonegotiation of speed, duplex mode, and flow control/Manual speed and duplex mode setup for the Ethernet port
Firewall functions	· MAC filter
Management	· Local and remote access to settings through TELNET/WEB (HTTP/HTTPS) · Bilingual web-based interface for configuration and management (Russian/English) · Firmware update via web-based interface · Automatic notification on new firmware version · Saving/restoring configuration to/from file · Support of logging to remote host · Automatic synchronization of system time with NTP server and manual time/date setup · Ping utility · Traceroute utility

* The device features are subject to change without notice. For the latest versions of the firmware and relevant documentation, visit www.dlink.ru.

Wireless Module Parameters	
Standards	· IEEE 802.11a/n/ac · IEEE 802.11b/g/n
Frequency range	· 2400 ~ 2483.5MHz · 5150 ~ 5350MHz · 5650 ~ 5725MHz
Wireless connection security	· WEP · WPA/WPA2 (Personal/Enterprise) · MAC filter · WPS (PBC/PIN)
Advanced functions	· Support of client mode · WMM (Wi-Fi QoS) · Information on connected Wi-Fi clients · Advanced settings · Smart adjustment of Wi-Fi clients · Support of MBSSID · Periodic scan of channels, automatic switch to least loaded channel · Autonegotiation of channel bandwidth in accordance with environment conditions (20/40 Coexistence)
Wireless connection rate	· IEEE 802.11a: 6, 9, 12, 18, 24, 36, 48, and 54Mbps · IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, and 54Mbps · IEEE 802.11n (2.4GHz/5GHz): from 6.5 to 300Mbps (from MCS0 to MCS15) · IEEE 802.11ac (5GHz): from 6.5 to 867Mbps (from MCS0 to MSC9)
Transmitter output power *The maximum value of the transmitter output power depends upon the radio frequency regulations applied in your country*	· 802.11a (typical at room temperature 25 °C) 17dBm (±1dB) at 6Mbps 14dBm (±1dB) at 54Mbps · 802.11g (typical at room temperature 25 °C) 16dBm (±1dB) at 6, 9, 12, 18, 24, 36Mbps 14dBm (±1dB) at 48, 54Mbps · 802.11n (typical at room temperature 25 °C) 2.4GHz, HT20 16dBm (±1dB) at MCS0~5 14dBm (±1dB) at MCS6~7 2.4GHz, HT40 15dBm (±1dB) at MCS0~5 13dBm (±1dB) at MCS6~7 · 802.11ac (typical at room temperature 25 °C) 17dBm (±1dB) at MCS0 13dBm (±1dB) at MCS9

Wireless Module Parameters	
Receiver sensitivity	· 802.11a (typical at PER < 10% (1000-byte PDUs) at room temperature 25 °C) -82dBm at 6Mbps -81dBm at 9Mbps -79dBm at 12Mbps -77dBm at 18Mbps -74dBm at 24Mbps -70dBm at 36Mbps -66dBm at 48Mbps -65dBm at 54Mbps · 802.11g (typical at PER < 10% (1000-byte PDUs) at room temperature 25 °C) -82dBm at 6Mbps -81dBm at 9Mbps -79dBm at 12Mbps -77dBm at 18Mbps -74dBm at 24Mbps -70dBm at 36Mbps -66dBm at 48Mbps -65dBm at 54Mbps · 802.11n (typical at PER = 10% (1000-byte PDUs)) 2.4GHz, HT20 -82dBm at MCS0 -79dBm at MCS1 -77dBm at MCS2 -74dBm at MCS3 -70dBm at MCS4 -66dBm at MCS5 -65dBm at MCS6 -64dBm at MCS7 HT40 -79dBm at MCS0 -76dBm at MCS1 -74dBm at MCS2 -71dBm at MCS3 -67dBm at MCS4 -63dBm at MCS5 -62dBm at MCS6 -61dBm at MCS7

Wireless Module Parameters	
	· 802.11ac (typical at PER = 10% (1000-byte PDUs)) HT20 -82dBm at MCS0 -79dBm at MCS1 -77dBm at MCS2 -74dBm at MCS3 -70dBm at MCS4 -66dBm at MCS5 -65dBm at MCS6 -64dBm at MCS7 -59dBm at MCS8 -57dBm at MCS9 HT40 -79dBm at MCS0 -76dBm at MCS1 -74dBm at MCS2 -71dBm at MCS3 -67dBm at MCS4 -63dBm at MCS5 -62dBm at MCS6 -61dBm at MCS7 -56dBm at MCS8 -54dBm at MCS9 HT80 -79dBm at MCS0 -73dBm at MCS1 -71dBm at MCS2 -68dBm at MCS3 -64dBm at MCS4 -60dBm at MCS5 -59dBm at MCS6 -58dBm at MCS7 -53dBm at MCS8 -51dBm at MCS9
Modulation schemes	· 802.11a: BPSK, QPSK, 16QAM, 64QAM with OFDM · 802.11g: BPSK, QPSK, 16QAM, 64QAM with OFDM · 802.11n: BPSK, QPSK, 16QAM, 64QAM with OFDM · 802.11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM with OFDM

Physical Parameters	
Dimensions (L x W x H)	· 51 x 49 x 98 mm (2 x 1.91 x 3.85 in)
Weight	· 120 g (0.26 lb)

Operating Environment	
Power	· Input: 110 to 240 V AC, 50/60 Hz
Temperature	· Operating: from 0 to 40 °C · Storage: from -20 to 70 °C
Humidity	· Operating: from 10% to 90% (non-condensing) · Storage: from 5% to 90% (non-condensing)

Product Appearance

Upper Panel

Figure 1. Upper panel view.

LED	Mode	Description
POWER/WPS	*Solid red*	The device is being loaded.
	Solid green	The device is ready for use.
	Blinking red	Attempting to add a wireless device via the WPS function.
	No light	The extender is powered off.
Wi-Fi Signal Strength	*Solid red*	The device is not connected to a wireless network or the signal strength is poor.
	Solid green	Fair signal strength.
	Solid green	Good signal strength.
	Solid green	Excellent signal strength.
	No light	The 2.4GHz and 5GHz bands are off.

The **Wi-Fi Signal Strength** LED is a LED scale. It shows the signal strength of the wireless network to which DAP-1610 is connected. The more LEDs are on, the better the signal strength is. To improve the signal strength, move the extender closer to the source of the signal.

The **RESET** and **WPS** buttons are located on the upper panel of the extender.

Button	Description
RESET	A button to restore the factory default settings. To restore the factory defaults, push the button (with the device turned on), hold it for 10 seconds, and then release the button.
WPS	A button to set up a wireless connection (the WPS function). To use the WPS function: with the device turned on, push the button, hold it for 2 seconds, and release. The **POWER/WPS** LED should start blinking.

The device is also equipped with two external non-detachable Wi-Fi antennas.

Bottom Panel

Figure 2. Bottom panel view.

Port	Description
LAN	An Ethernet port to connect to a computer or a wired router.

Delivery Package

The following should be included:

- Extender DAP-1610
- "***Quick Installation Guide***" (brochure).

The "***User Manual***" and "***Quick Installation Guide***" documents are available on D-Link website (see www.dlink.ru).

! Using a power supply with different parameters than those indicated on the device will cause damage and void the warranty for this product.

CHAPTER 3. INSTALLATION AND CONNECTION

Before You Begin

Please, read this manual prior to installing the device. Make sure that you have all the necessary information and equipment.

Operating System

Configuration of the wireless extender DAP-1610 (hereinafter referred to as "the extender") is performed via the built-in web-based interface. The web-based interface is available from any operating system that supports a web browser.

Web Browser

The following web browsers are recommended:

- Apple Safari 8 and later
- Google Chrome 48 and later
- Microsoft Internet Explorer 10 and later
- Microsoft Edge 20.10240 and later
- Mozilla Firefox 44 and later
- Opera 35 and later.

For successful operation, JavaScript should be enabled on the web browser. Make sure that JavaScript has not been disabled by other software (such as virus protection or web user security packages) running on your computer.

Wired or Wireless NIC (Ethernet or Wi-Fi Adapter)

Any computer that uses the extender should be equipped with an Ethernet or Wi-Fi adapter (NIC). If your computer is not equipped with such a device, install an Ethernet or Wi-Fi adapter prior to using the extender.

Wireless Connection

Wireless workstations from your network should be equipped with a wireless 802.11a, b, g, n, or ac NIC (Wi-Fi adapter). In addition, you should specify the values of SSID, channel number and security settings defined in the web-based interface of the extender for all these wireless workstations.

Connecting to PC

PC with Ethernet Adapter

1. Connect an Ethernet cable between the Ethernet port of the extender and the Ethernet port of your PC.
2. Plug the device into an electrical outlet or power strip.

Now you should configure your PC to obtain an IP address automatically (as DHCP client).

Obtaining IP Address Automatically in OS Windows 7

1. Click the **Start** button and proceed to the **Control Panel** window.
2. Select the **Network and Sharing Center** section. (If the Control Panel has the category view (the **Category** value is selected from the **View by** drop-down list in the top right corner of the window), choose the **View network status and tasks** line under the **Network and Internet** section.)

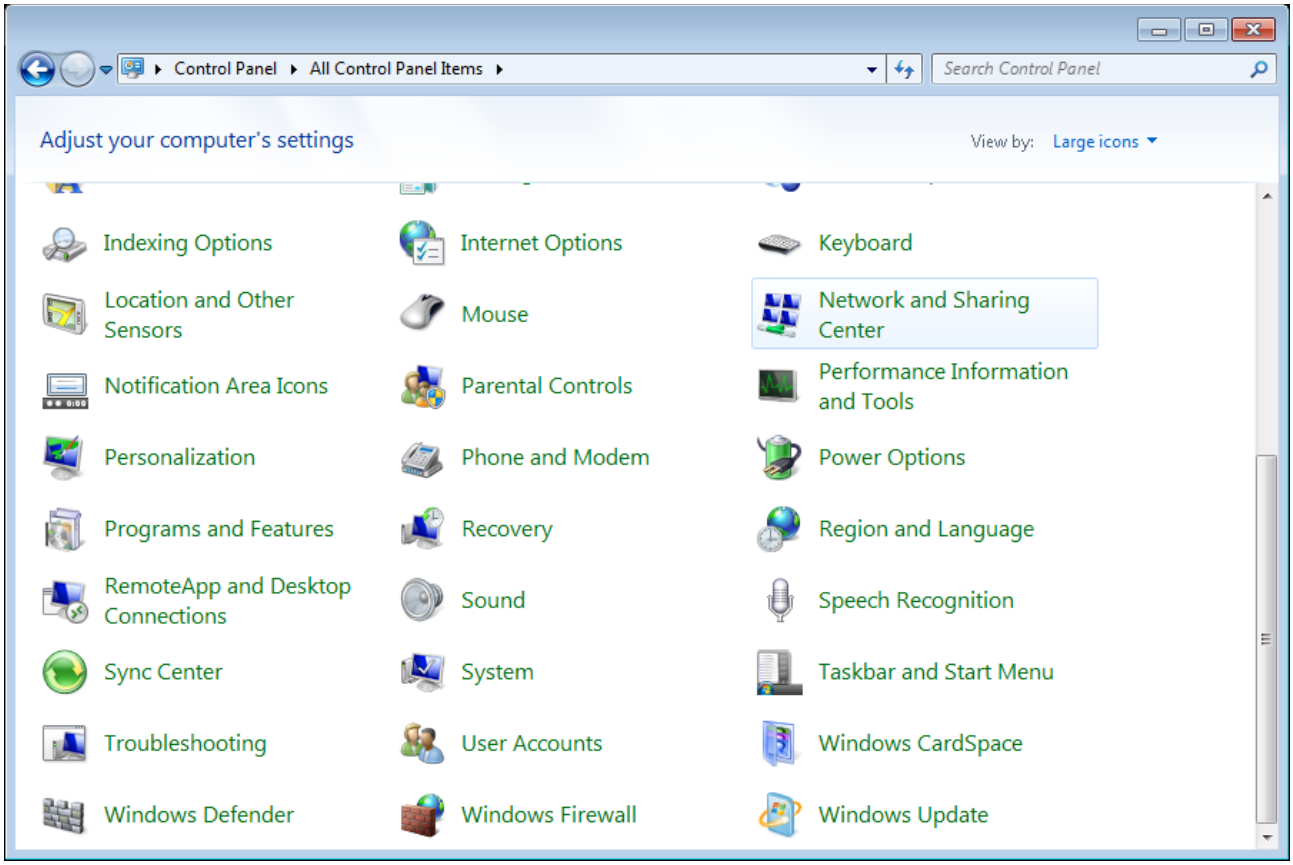


*Figure 3. The **Control Panel** window.*

3. In the menu located on the left part of the window, select the **Change adapter settings** line.

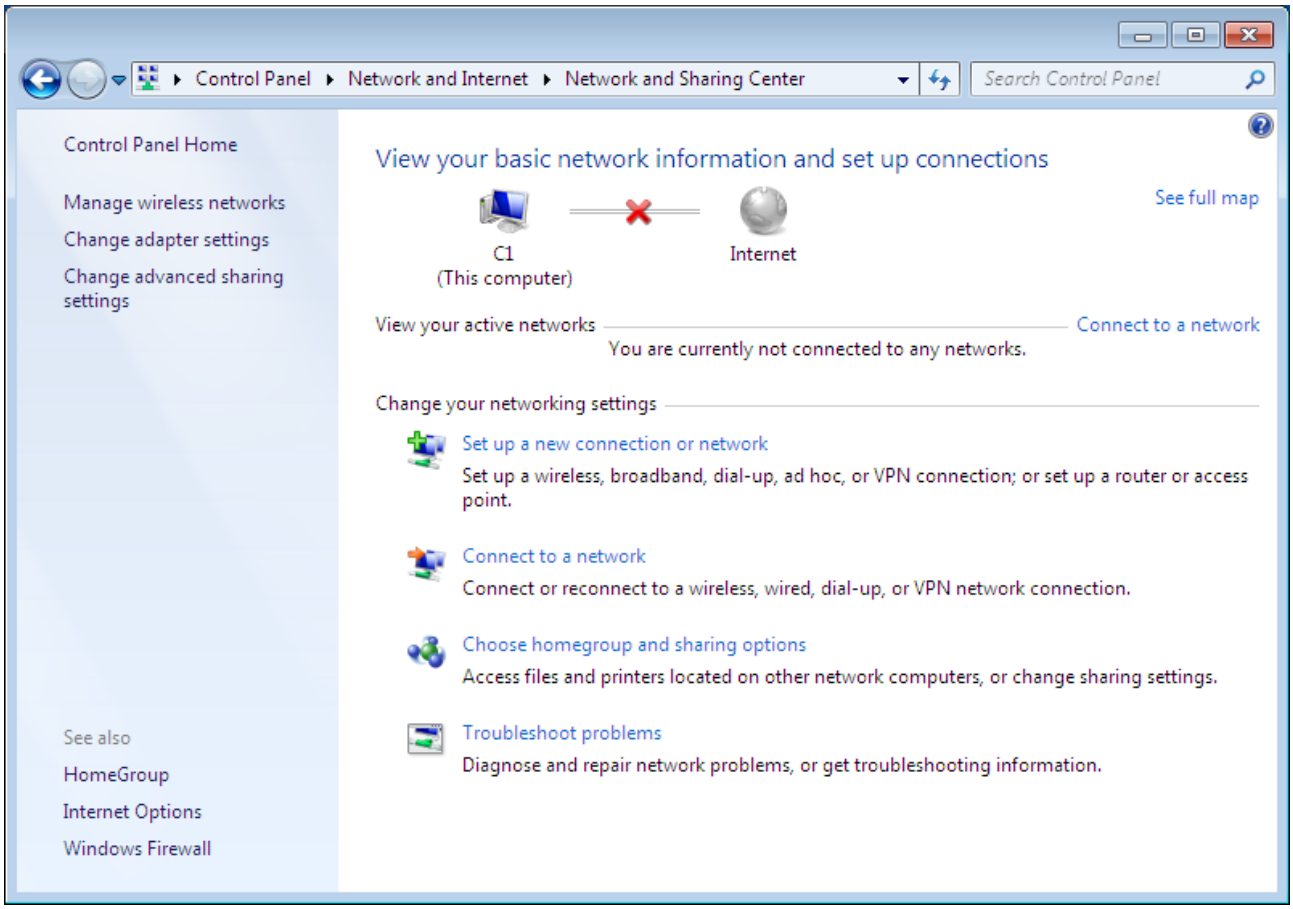


*Figure 4. The **Network and Sharing Center** window.*

4. In the opened window, right-click the relevant **Local Area Connection** icon and select the **Properties** line in the menu displayed.

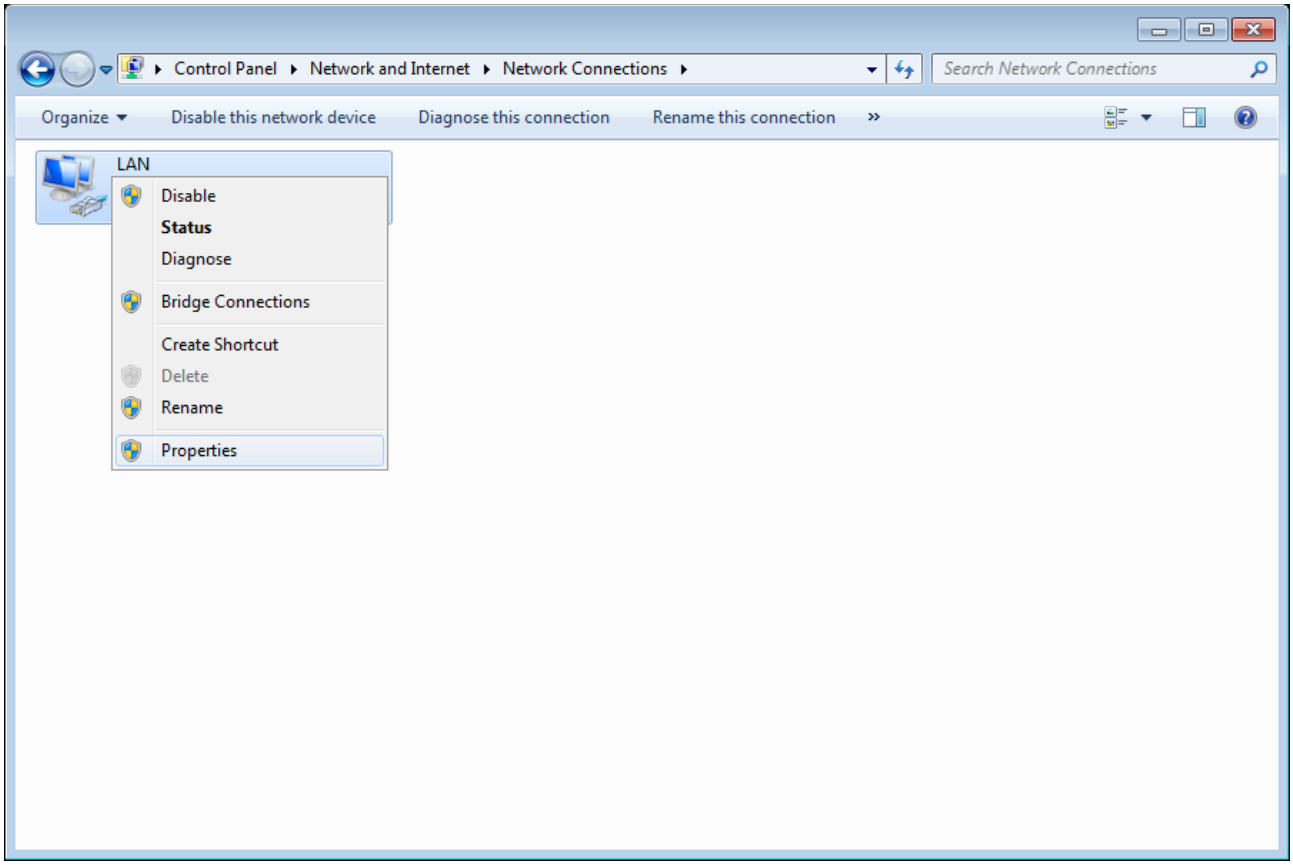


*Figure 5. The **Network Connections** window.*

5. In the **Local Area Connection Properties** window, on the **Networking** tab, select the **Internet Protocol Version 4 (TCP/IPv4)** line. Click the **Properties** button.

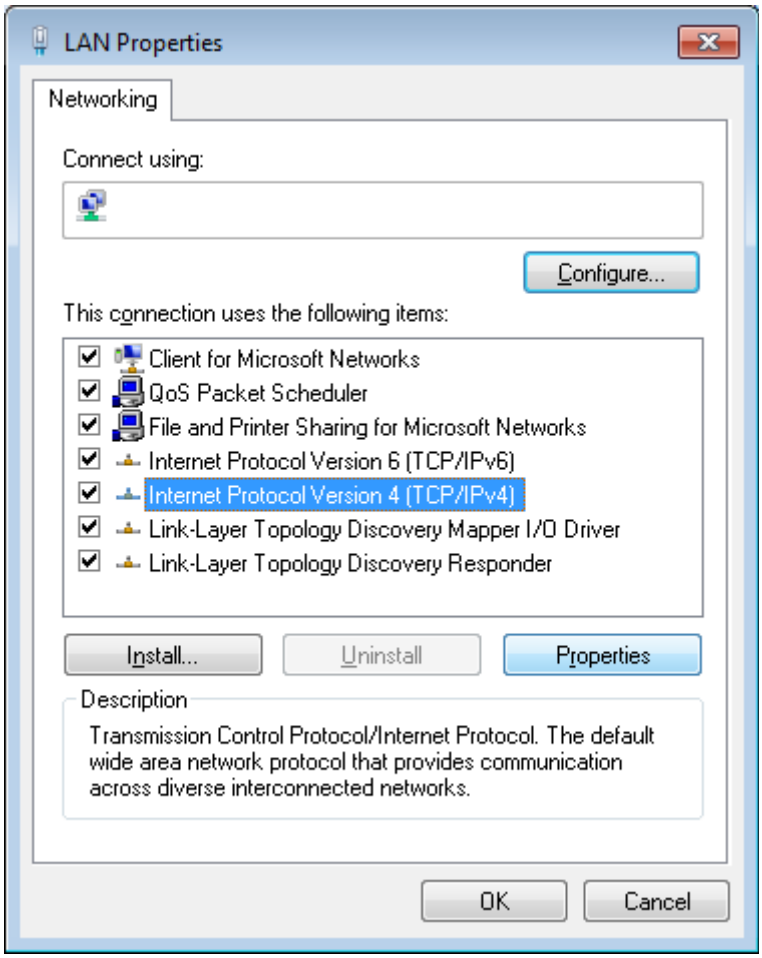


*Figure 6. The **Local Area Connection Properties** window.*

6. Select the **Obtain an IP address automatically** and **Obtain DNS server address automatically** radio buttons. Click the **OK** button.

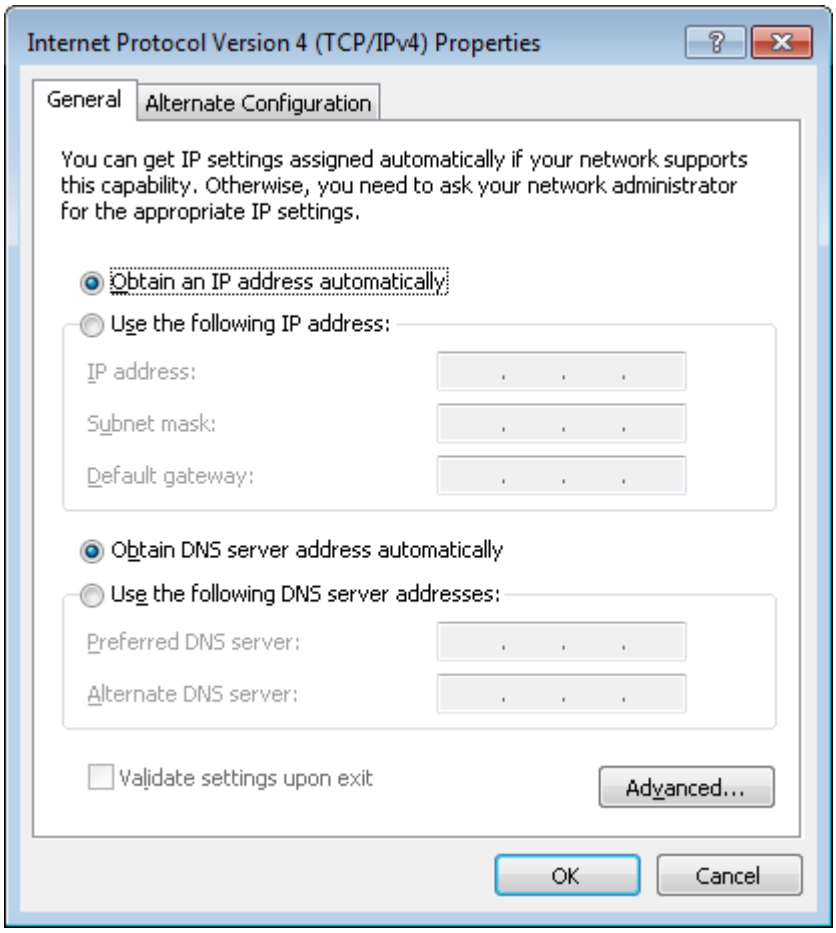


*Figure 7. The **Internet Protocol Version 4 (TCP/IPv4) Properties** window.*

7. Click the **OK** button in the connection properties window.

Now your computer is configured to obtain an IP address automatically.

PC with Wi-Fi Adapter

1. Plug the device into an electrical outlet or power strip.
2. Turn on your Wi-Fi adapter. As a rule, modern notebooks with built-in wireless NICs are equipped with a button or switch that turns on/off the wireless adapter (refer to your PC documents). If your PC is equipped with a pluggable wireless NIC, install the software provided with your Wi-Fi adapter.

Now you should configure your Wi-Fi adapter.

Configuring Wi-Fi Adapter in OS Windows 7

1. Click the **Start** button and proceed to the **Control Panel** window.
2. Select the **Network and Sharing Center** section. (If the Control Panel has the category view (the **Category** value is selected from the **View by** drop-down list in the top right corner of the window), choose the **View network status and tasks** line under the **Network and Internet** section.)

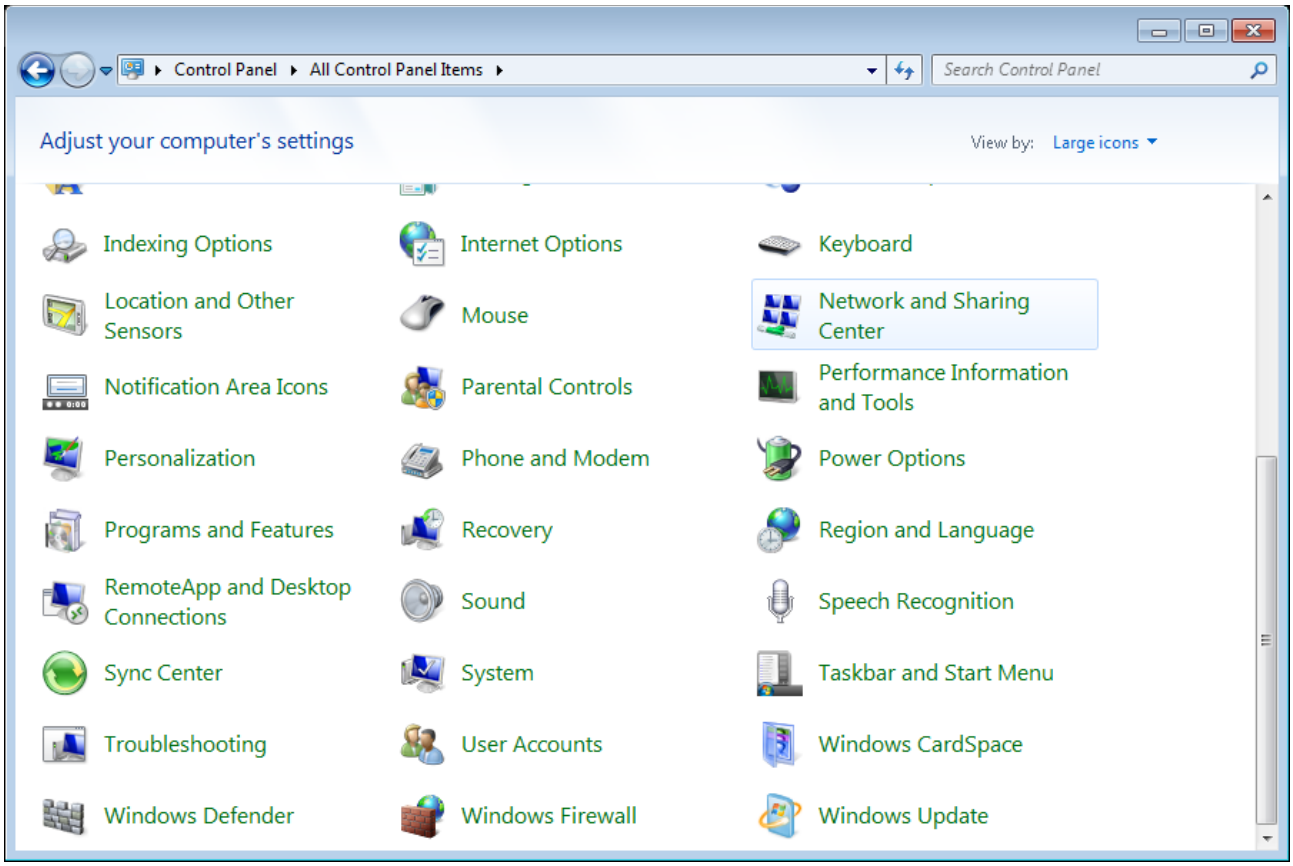


*Figure 8. The **Control Panel** window.*

3. In the menu located on the left part of the window, select the **Change adapter settings** line.
4. In the opened window, select the icon of the wireless network connection and make sure that your Wi-Fi adapter is on.

5. To open the list of available wireless networks, select the icon of the wireless network connection and click the **Connect To** button or left-click the network icon in the notification area located on the right side of the taskbar.

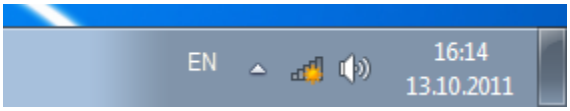


Figure 9. The notification area of the taskbar.

6. In the opened window, in the list of available wireless networks, select the wireless network **DAP-1610** (for operating in the 2.4GHz band) or **DAP-1610-5G** (for operating in the 5GHz band)and click the **Connect** button.

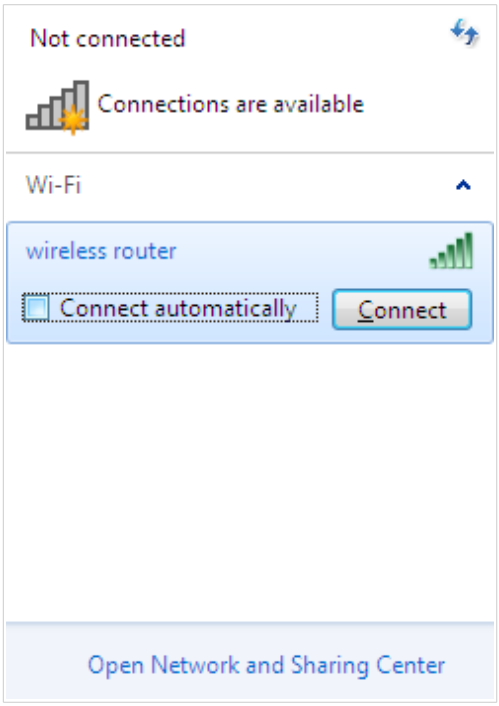


Figure 10. The list of available networks.

7. In the opened window, enter the network key (see WPS PIN on the barcode label on the bottom panel of the device) in the **Security key** field and click the **OK** button.
8. Wait for about 20-30 seconds. After the connection is established, the network icon will be displayed as the signal level scale.

If you perform initial configuration of the extender via Wi-Fi connection, note that immediately after changing the wireless default settings of the extender you will need to reconfigure the wireless connection using the newly specified settings.

Connecting to Web-based Interface

When you have configured your computer, you can access the web-based interface and configure needed parameters (change the parameters of the wireless network, specify the settings of the firewall, etc.).

Start a web browser (see the ***Before You Begin*** section, page 13). In the address bar of the web browser, enter the domain name of the extender (by default, **`dlinkap.local`**) with a dot at the end and press the **Enter** key. Also you can enter the IP address of the device (by default, **`192.168.0.50`**).

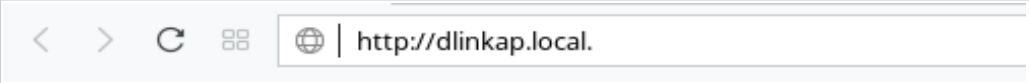


Figure 11. Connecting to the web-based interface of the DAP-1610 device.

If the error "*The page cannot be displayed*" (or "*Unable to display the page*"/"*Could not connect to remote server*") occurs upon connecting to the web-based interface of the extender, make sure that you have properly connected the extender to your computer.

If the device has not been configured previously or the default settings have been restored, after access to the web-based interface the Initial Configuration Wizard opens (see the ***Initial Configuration Wizard*** section, page 26).

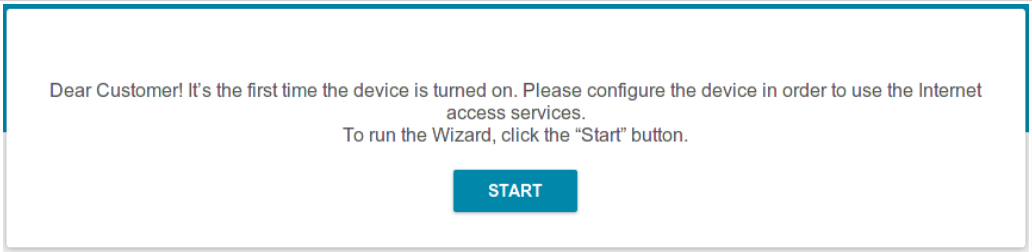


Figure 12. The page for running the Initial Configuration Wizard.

If you configured the device previously, after access to the web-based interface the login page opens. Enter the username (**admin**) in the **Username** field and the password you specified in the **Password** field, then click the **LOGIN** button.

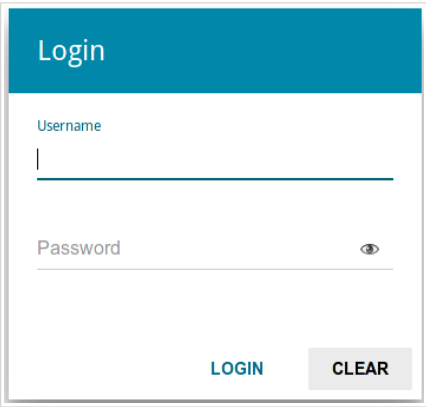


Figure 13. The login page.

Web-based Interface Structure

Summary Page

On the **Summary** page, detailed information on the device state is displayed.

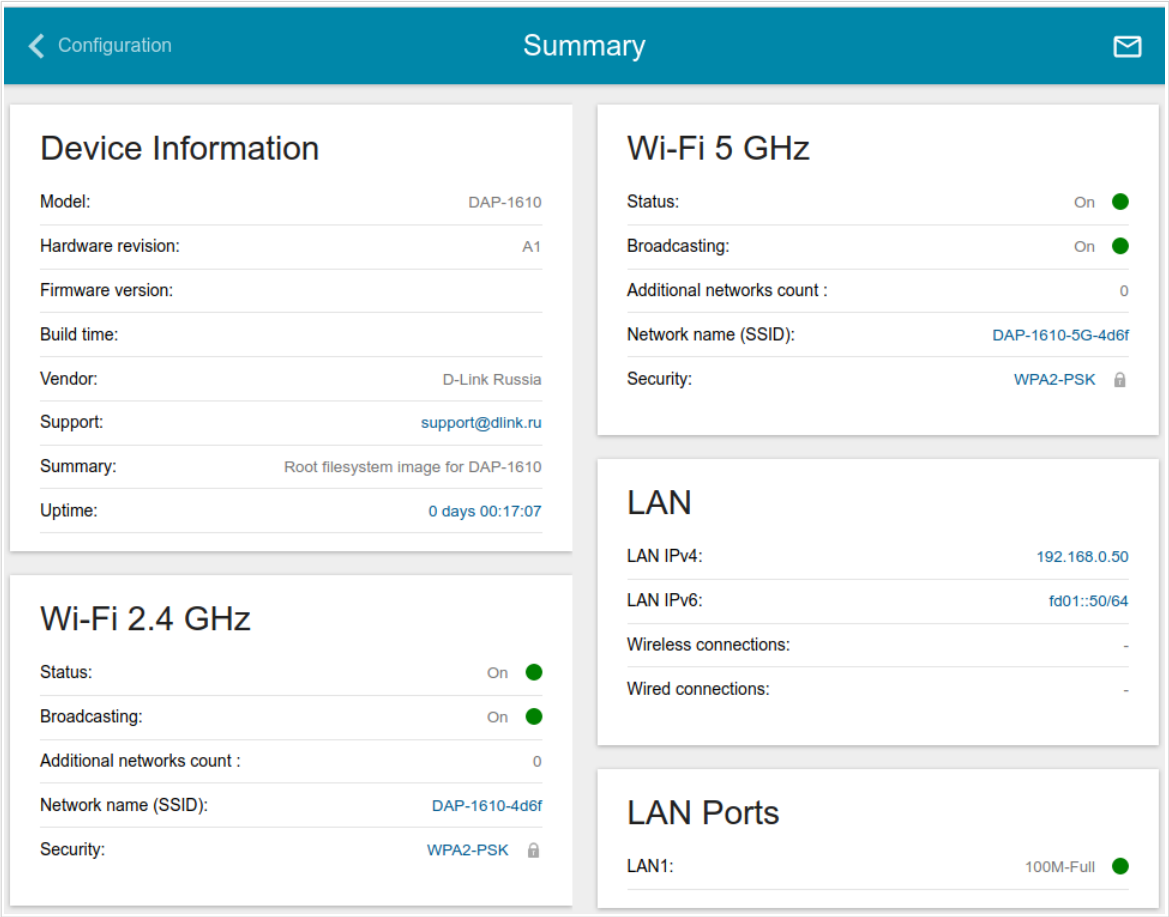


Figure 14. The summary page.

The **Device Information** section displays the model and hardware version of the extender, the firmware version, and other data.

To contact the technical support group (to send an e-mail), left-click the support e-mail address. After clicking the line, the e-mail client window for sending a new letter to the specified address opens.

The **Wi-Fi 2.4 GHz** and **Wi-Fi 5 GHz** sections display data on the state of the device's wireless network, its name and the authentication type, and availability of an additional wireless network in the relevant band.

In the **LAN** section, the IPv4 and IPv6 address of the extender and the number of wired and wireless clients of the device are displayed.

The **LAN Ports** section displays the state and data transfer mode of the device's LAN port.

Other settings of the extender are available in the menu in the left part of the page.

Menu Sections

To configure the extender use the menu in the left part of the page.

In the **Initial Configuration** section you can run the Initial Configuration Wizard. The Wizard allows you to configure the extender for operation in the needed mode and specify all parameters necessary for getting started (for the description of the Wizard, see the ***Initial Configuration Wizard*** section, page 26).

The pages of the **Statistics** section display data on the current state of the extender (for the description of the pages, see the ***Statistics*** section, page 34).

The page of the **Connections Setup** section is designed for configuring basic parameters of the LAN interface of the extender (for the description of the page, see the ***Connections Setup*** section, page 38).

The pages of the **Wi-Fi** section are designed for specifying all needed settings of the extender's wireless network (for the description of the pages, see the ***Wi-Fi*** section, page 42).

The page of the **Advanced** section is designed for adding DNS servers to the system (for the description of the page, see the ***Advanced*** section, page 67).

The page of the **Firewall** section is designed for configuring the MAC filter of the extender (for the description of the page, see the ***Firewall*** section, page 71).

The pages of the **System** section provide functions for managing the internal system of the extender (for the description of the pages, see the ***System*** section, page 73).

To exit the web-based interface, click the **Logout** line of the menu.

Notifications

The extender's web-based interface displays notifications in the top right part of the page.

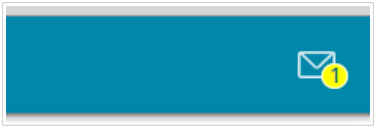


Figure 15. The web-based interface notifications.

Click the icon displaying the number of notifications to view the complete list and click the relevant button.

CHAPTER 4. CONFIGURING VIA WEB-BASED INTERFACE

Initial Configuration Wizard

To start the Initial Configuration Wizard, go to the **Initial Configuration** section. On the opened page, click the **OK** button and wait until the factory default settings are restored.

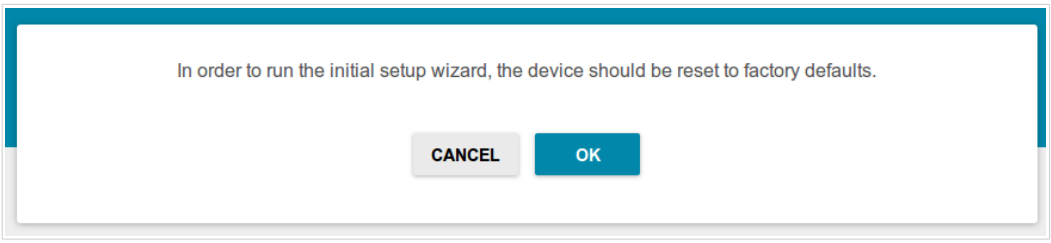


Figure 16. Restoring the default settings in the Wizard.

If you perform initial configuration of the extender via Wi-Fi connection, please make sure that you are connected to the wireless network of DAP-1610 (see the WLAN name (SSID) on the barcode label on the back panel of the device) and click the **NEXT** button.

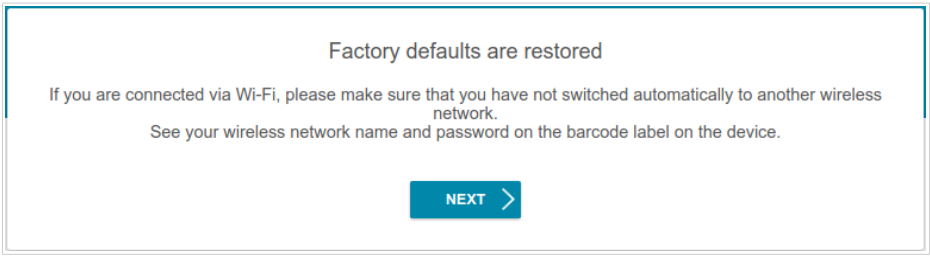


Figure 17. Checking connection to the wireless network.

Click the **START** button.

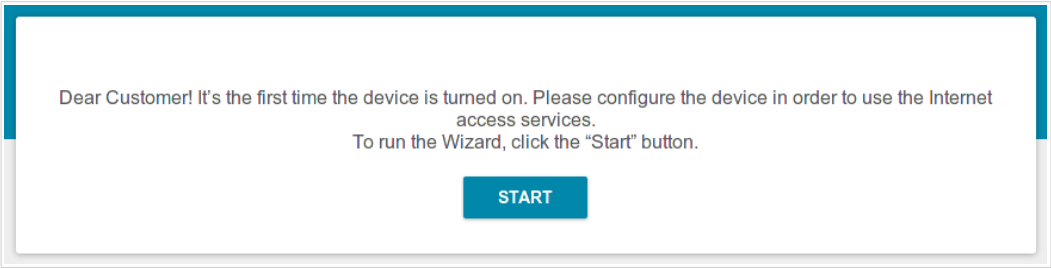


Figure 18. Starting the Wizard.

On the opened page, click **YES** in order to leave the current language of the web-based interface or click **NO** to select the other language.

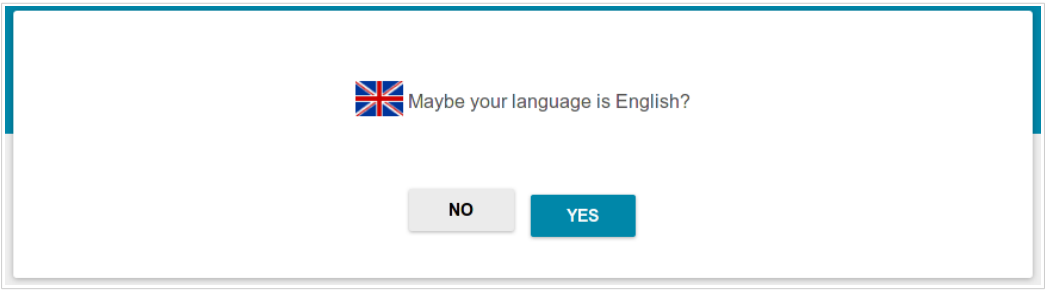


Figure 19. Selecting a language.

You can finish the wizard earlier and go to the menu of the web-based interface. To do this, click the **ADVANCED SETTINGS** button. On the opened page, change the default settings: specify the administrator password in the **Admin password** field and the name of the wireless network in the 2.4GHz and 5GHz bands in the **Network name 2.4GHz (SSID)** and **Network name 5GHz (SSID)** fields correspondingly. Then click the **APPLY** button.

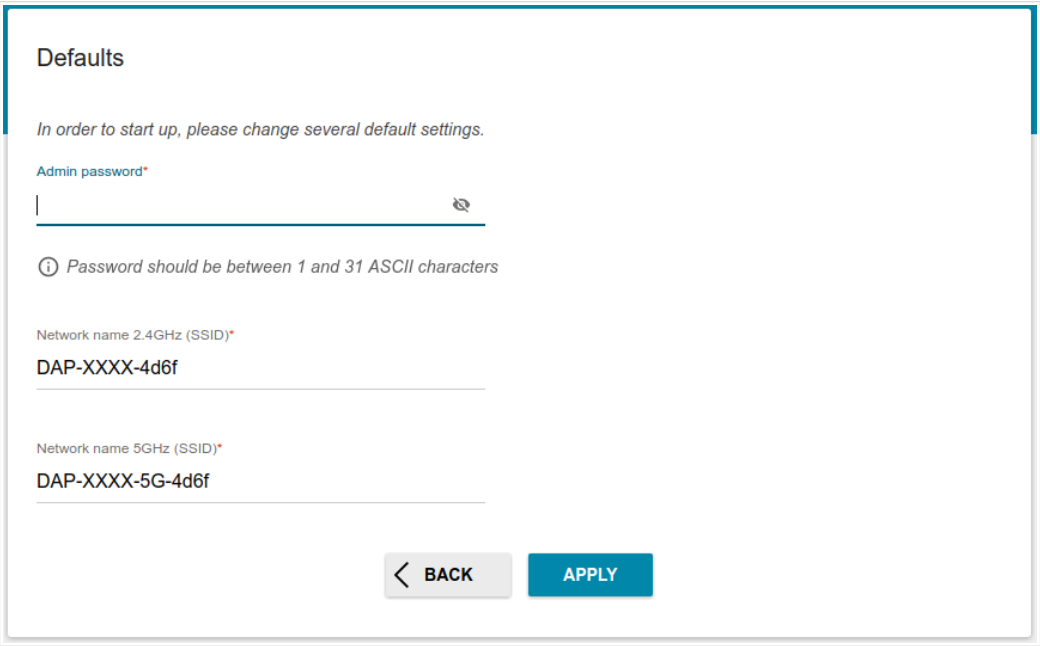


Figure 20. Changing the default settings.

To continue the configuration of the extender via the Wizard, click the **CONTINUE** button.

Selecting Operation Mode

In order to connect your device to a wired router for adding a wireless network to the existing local network, on the **Device mode** page, from the **Connection method** list, select the **Wired connection** value. In this mode you can change the LAN IP address, set your own settings for the wireless network and set your own password for access to the web-based interface of the device.

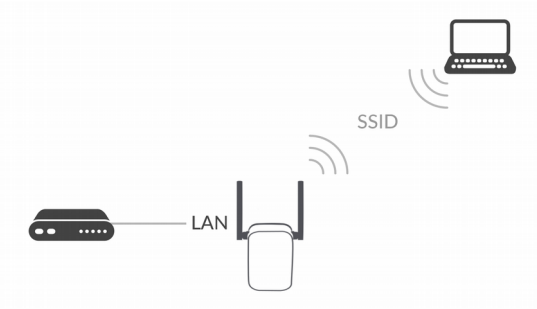


*Figure 21. Selecting an operation mode. The **Access point** mode.*

In order to connect your device to a wireless router for extending the range of the existing wireless network, on the **Device mode** page, from the **Connection method** list, select the **Wi-Fi** value. Then from the **Work mode** list select the **Repeater** value. In this mode you can change the LAN IP address, connect your device to another access point, set your own settings for the wireless network, and set your own password for access to the web-based interface of the device.

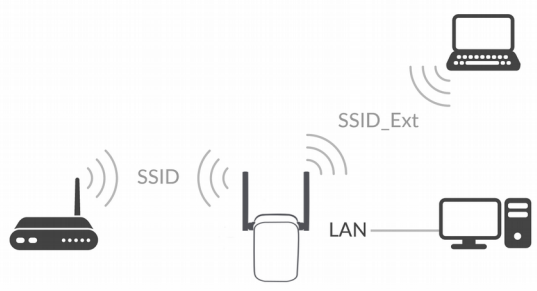


*Figure 22. Selecting an operation mode. The **Repeater** mode.*

In order to let a wired PC connected to your device access the network of a wireless router, on the **Device mode** page, from the **Connection method** list, select the **Wi-Fi** value. Then from the **Work mode** list select the **Client** value. In this mode you can change the LAN IP address, connect your device to another access point and set your own password for access to the web-based interface of the device.

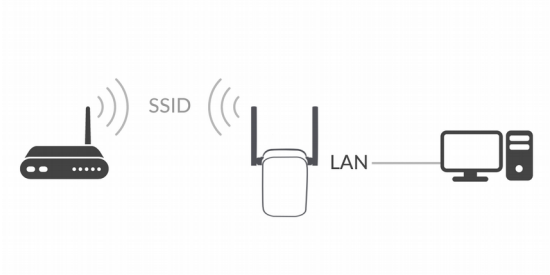


*Figure 23. Selecting an operation mode. The **Client** mode.*

When the operation mode is selected, click the **NEXT** button.

Changing LAN IPv4 Address

This configuration step is available for the **Access point**, **Repeater**, and **Client** modes.

1. Select the **Automatic obtainment of IPv4 address** to let DAP-1610 automatically obtain the LAN IPv4 address.

> **!** If the extender obtains the LAN IPv4 address automatically, then after finishing the Wizard you can access the web-based interface using the domain name (by default, `dlinkap.local`) with a dot at the end.

If you want to manually assign the LAN IPv4 address for DAP-1610, do not select the **Automatic obtainment of IPv4 address** checkbox and fill in the **IP address** and **Netmask** fields and, if needed, the **Gateway IP address** field. Make sure that the assigned address does not coincide with the LAN IPv4 address of the router to which your device connects.

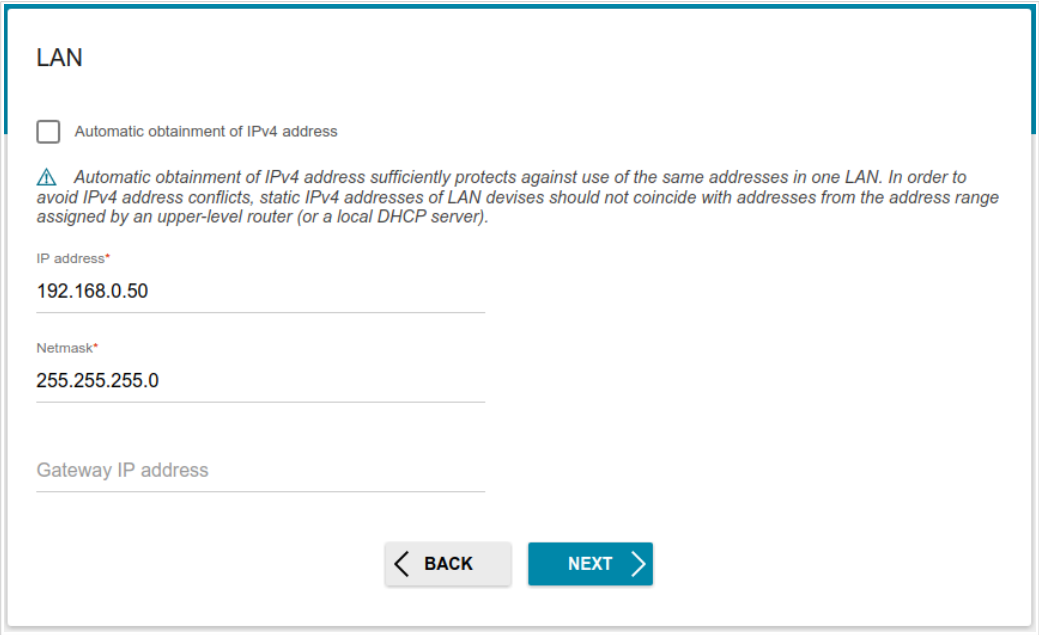


Figure 24. The page for changing the LAN IPv4 address.

2. Click the **NEXT** button to continue or click the **BACK** button to return to the previous page.

Wi-Fi Client

This configuration step is available for the **Repeater** and **Client** modes.

1. On the **Wi-Fi client** page, in the **Wireless Networks** section, select the network to which you want to connect. When you select a network, the **Network name (SSID)** and **BSSID** fields are filled in automatically.

If you cannot find the needed network in the list, click the **UPDATE LIST** button.

2. If a password is needed to connect to the selected network, fill in the relevant field.

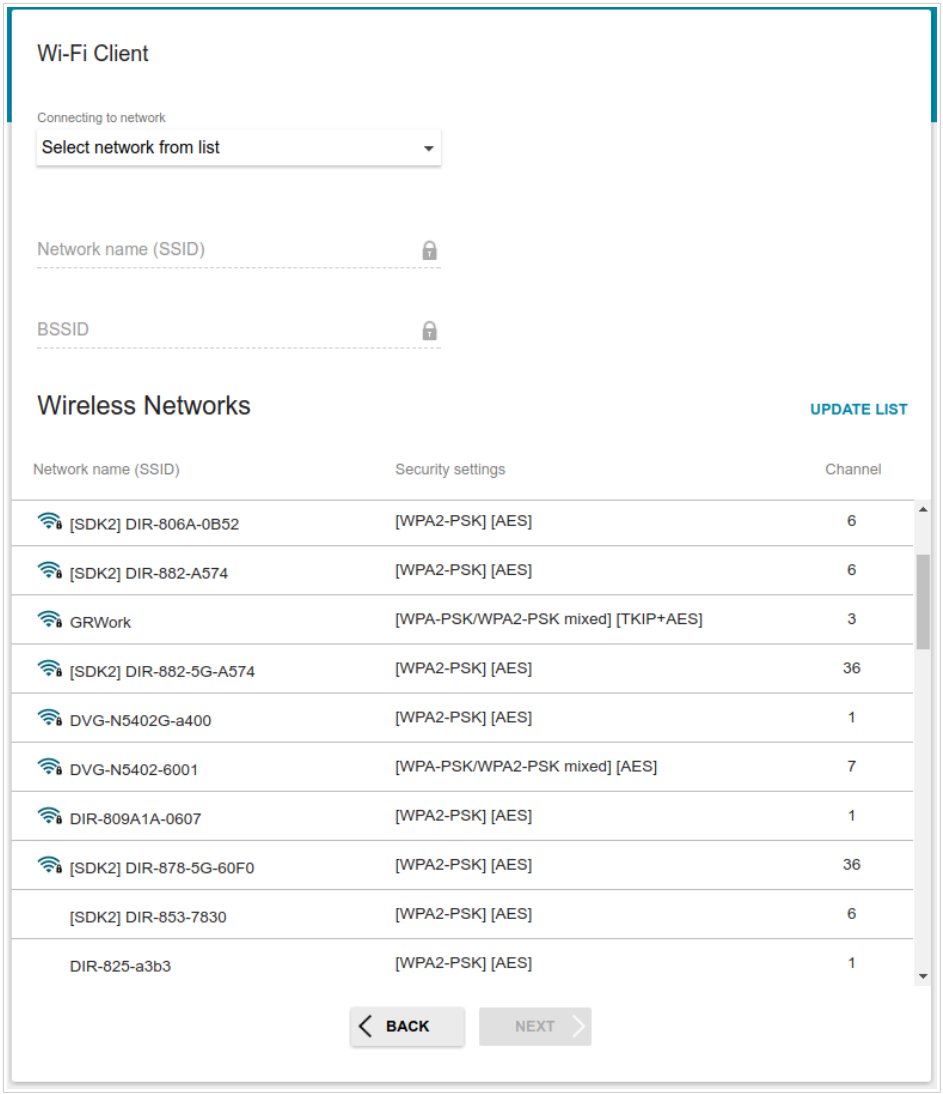


Figure 25. The page for configuring the Wi-Fi client.

If you connect to a hidden network, from the **Connecting to network** list select the **Connect to hidden network** value. Then select the band where the hidden network operates from the **Frequency band** list and enter the network name in the **Network name (SSID)** field. Then select a needed value from the **Network authentication** list and then, if needed, enter the password in the relevant field.

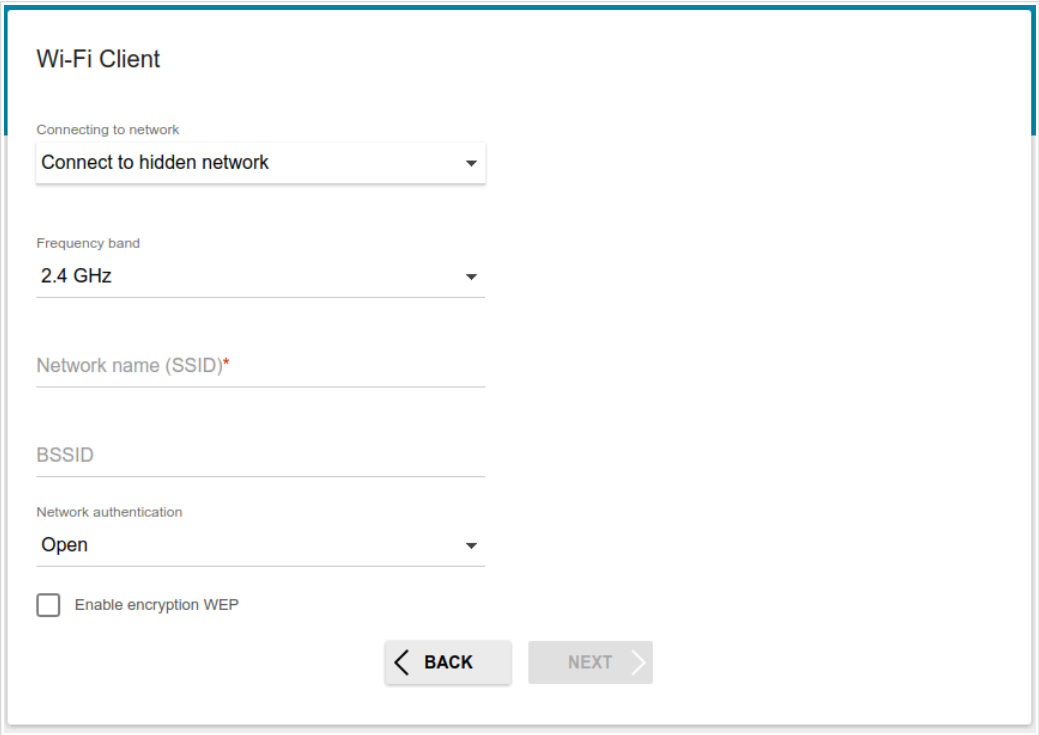


Figure 26. The page for configuring connection to a hidden network.

3. Click the **NEXT** button to continue or click the **BACK** button to return to the previous page.

Configuring Wireless Network

This configuration step is available for the **Access point** and **Repeater** modes.

1. On the **Wireless Network 2.4 GHz** page, in the **Network name** field, specify your own name for the wireless network in the 2.4GHz band or leave the value suggested by the extender.
2. In the **Password** field, specify your own password for access to the wireless network or leave the value suggested by the extender (WPS PIN of the device, see the barcode label).
3. You can restore the parameters of the wireless network specified before resetting to factory defaults. To do this, click the **RESTORE** button.

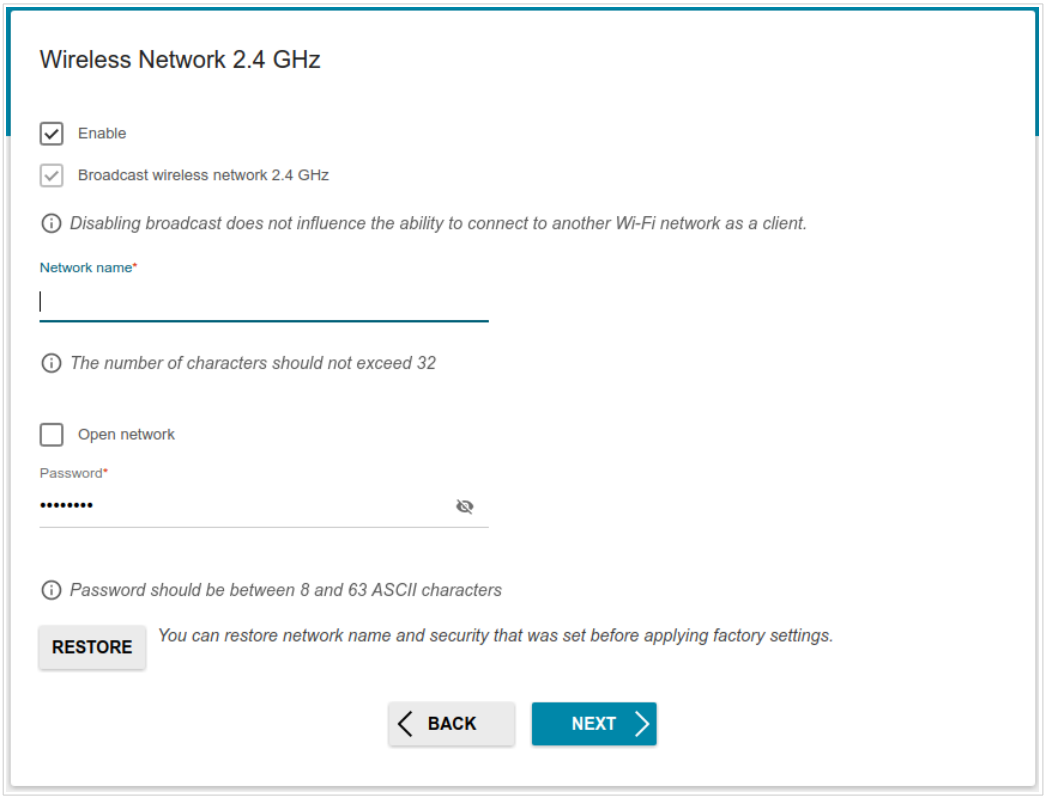


Figure 27. The page for configuring the wireless network.

4. Click the **NEXT** button to continue or click the **BACK** button to specify other settings.
5. On the **Wireless Network 5 GHz** page, specify needed settings for the wireless network in the 5GHz band and click the **NEXT** button.

Changing Web-based Interface Password

On this page, you should change the default administrator password. You may set any password except **admin**. Use digits, Latin letters (uppercase and/or lowercase), and other characters available in the US keyboard layout.[2]

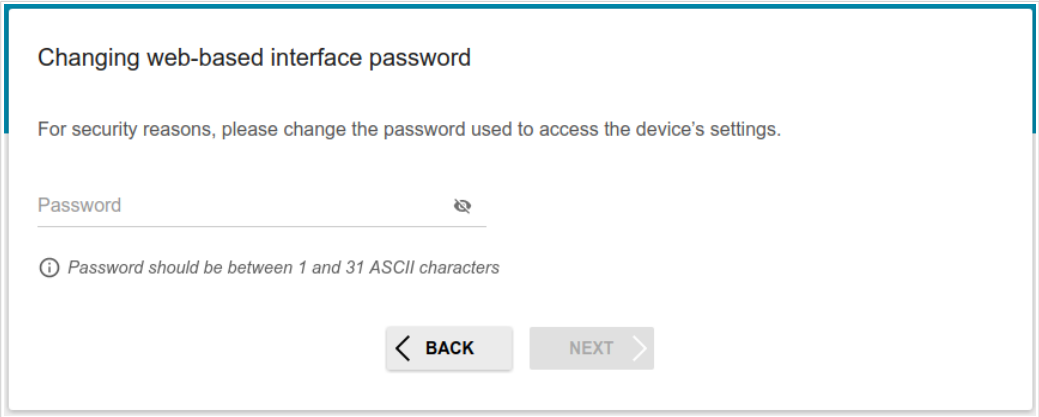


Figure 28. The page for changing the web-based interface password.

Remember or write down the new password for the administrator account. In case of losing the new password, you can access the settings of the extender only after restoring the factory default settings via the hardware **RESET** button. This procedure wipes out all settings that you have configured for your extender.

Click the **NEXT** button to continue or click the **BACK** button to return to the previous page.

On the next page, check all specified settings.

Also you can save a text file with parameters set by the Wizard to your PC. To do this, click the **SAVE CONFIGURATION FILE** button and follow the dialog box appeared.

To finish the Wizard, click the **APPLY** button. The extender will apply settings and reboot. Click the **BACK** button to specify other settings.

2 0-9, A-Z, a-z, space, !"#$%&'()*+,-./:;<=>?@[\]^_`{|}~.

Statistics

The pages of this section display data on the current state of the extender:

- network statistics
- IP addresses leased by the DHCP server
- data on devices connected to the extender's network and its web-based interface
- addresses of active multicast groups.

Network Statistics

On the **Statistics / Network Statistics** page, you can view statistics for all connections existing in the system. For each connection the following data are displayed: name and state (when the connection is on, its name is highlighted in green, when the connection is off, its name is highlighted in red), IP address and subnet mask, gateway (if the connection is established), MAC address, and volume of data received and transmitted (with increase of the volume the units of measurement are changed automatically: byte, Kbyte, Mbyte, Gbyte).

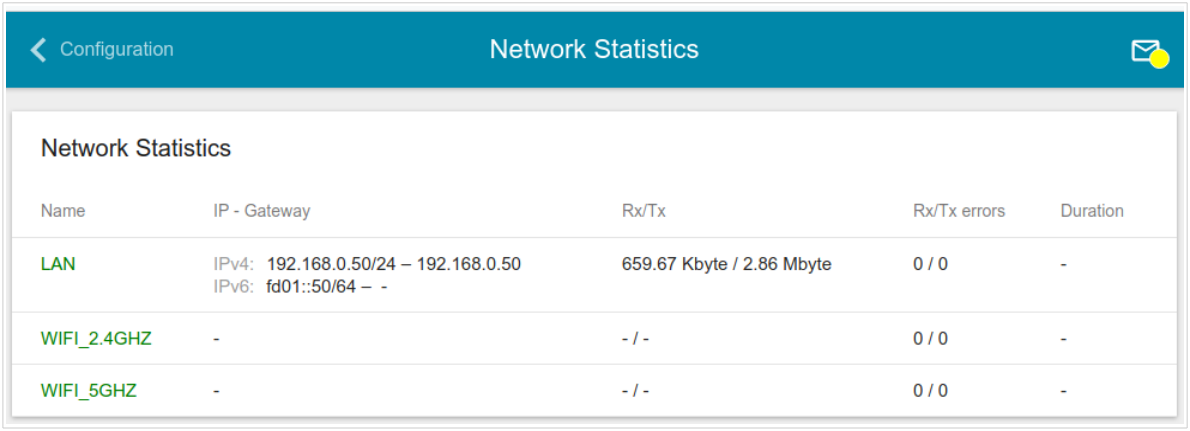


*Figure 29. The **Statistics / Network Statistics** page.*

To view data on a connection, click the line corresponding to this connection.

DHCP

The **Statistics / DHCP** page displays the information on computers that have been identified by hostnames and MAC addresses and have got IP addresses from the DHCP server of the device, as well as the IP address expiration periods (the lease time).

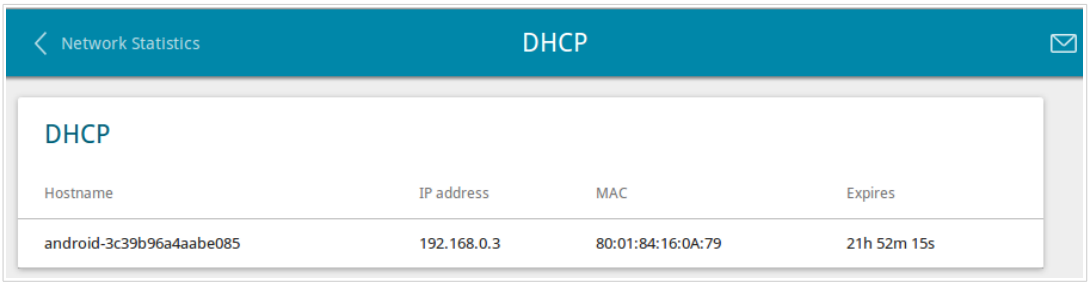


*Figure 30. The **Statistics / DHCP** page.*

Clients

On the **Statistics / Clients** page, you can view the list of devices connected to the extender.

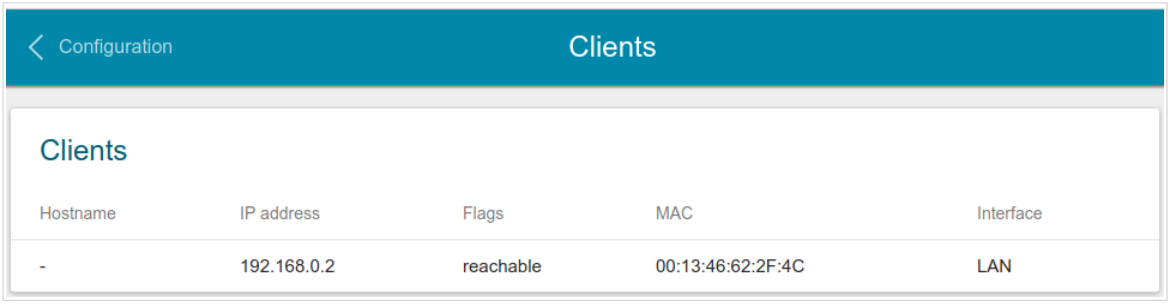


*Figure 31. The **Statistics / Clients** page.*

For each device the following data are displayed: the IP address, the MAC address, and the network interface to which the device is connected.

Multicast Groups

The **Statistics / Multicast Groups** page displays addresses of active multicast groups (including IPTV channels and groups for transferring service information) to which the device is subscribed, and the interface through which the device is subscribed.

*Figure 32. The **Statistics / Multicast Groups** page.*

Connections Setup

In this menu you can configure basic parameters of the extender for operation in the local network.

LAN

To configure the extender's basic parameters, go to the **Connections Setup / LAN** page.

IPv4

Go to the **IPv4** tab to change IPv4 address and configure the built-in DHCP server.

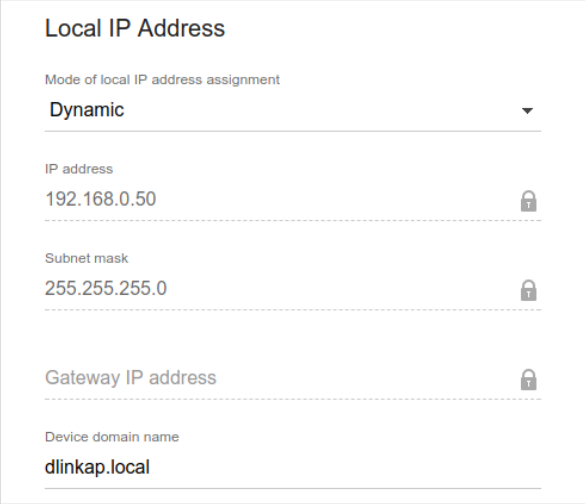


*Figure 33. Configuring the local interface. The **IPv4** tab. The **Local IP Address** section.*

Parameter	Description
Local IP Address	
Mode of local IP address assignment	Select the needed value from the drop-down list. **Static**: the IP address, subnet mask, and the gateway IP address are assigned manually. **Dynamic**: the extender automatically obtains these parameters from the LAN DHCP server or from the router to which it connects.
IP address	The IP address of the extender in the local subnet. By default, the following value is specified: `192.168.0.50`.
Subnet mask	The mask of the local subnet. By default, the following value is specified: `255.255.255.0`.
Gateway IP address	The gateway IP address which is used by the extender to connect to the Internet (e.g., for synchronizing the system time with an NTP server). *Optional*.
Device domain name	The name of the device assigned to its IP address in the local subnet.

When needed settings are configured, click the **APPLY** button.

In the **Dynamic IP Addresses** section, you can configure the built-in DHCP server of the extender.

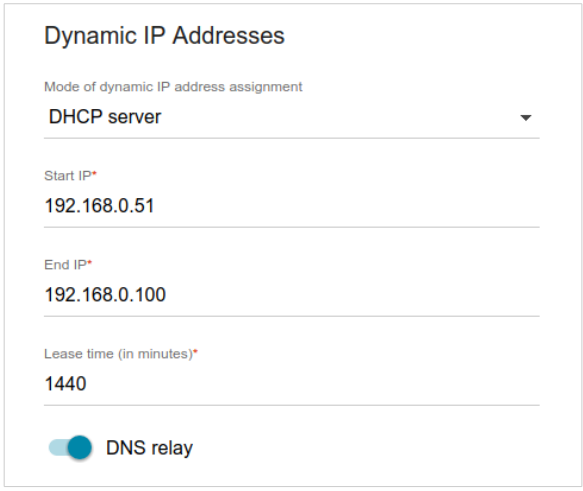


*Figure 34. Configuring the local interface. The **IPv4** tab. The **Dynamic IP Addresses** section.*

Parameter	Description
Dynamic IP Addresses	
Mode of dynamic IP address assignment	An operating mode of the extender's DHCP server. **Disable**: the extender's DHCP server is disabled, clients' IP addresses are assigned manually. **DHCP server**: the extender assigns IP addresses to clients automatically in accordance with the specified parameters. When this value is selected, the **Start IP**, **End IP**, **Lease time** fields and the **DNS relay** switch are displayed on the tab.
Start IP	The start IP address of the address pool used by the DHCP server to distribute IP addresses to clients.
End IP	The end IP address of the address pool used by the DHCP server to distribute IP addresses to clients.
Lease time	The lifetime of IP addresses leased by the DHCP server. At the end of this period the leased IP address is revoked and can be distributed to another device, unless the previous device has confirmed the need to keep the address.
DNS relay	Move the switch to the right so that the devices connected to the extender obtain the address of the extender as the DNS server address. Move the switch to the left so that the devices connected to the extender obtain the address transmitted by the ISP or specified on the **Advanced / DNS** page as the DNS server address.

When all needed settings are configured, click the **APPLY** button.

In the **Static IP Addresses** section, you can specify MAC address and IP address pairs (set a fixed IPv4 address in the local area network for a device with a certain MAC address).

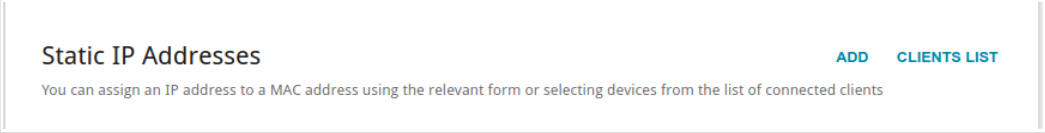


Figure 35. The section for creating MAC-IP pairs.

To create a MAC-IP pair, click the **ADD** button. In the opened window, in the **IP address** field, enter an IPv4 address which will be assigned to the device from the LAN, then in the **MAC address** field, enter the MAC address of this device. In the **Hostname** field, specify a network name of the device for easier identification (*optional*). Click the **APPLY** button.

In order to view MAC addresses of the devices connected to the extender at the moment, click the **CLIENTS LIST** button. In the opened window, select the needed device and click the **OK** button. To view the latest list of the connected devices, click the **REFRESH** button.

To edit the settings for the existing MAC-IP pair, left-click the relevant line in the table. In the opened window, change the needed parameters and click the **APPLY** button.

To remove a MAC-IP pair, select the checkbox located to the left of the relevant line in the table and click the **DELETE** button. Then click the **APPLY** button. Also you can remove a MAC-IP pair in the editing window.

IPv6

Go to the **IPv6** tab to change IPv6 address of the extender and configure IPv6 addresses assignment settings.

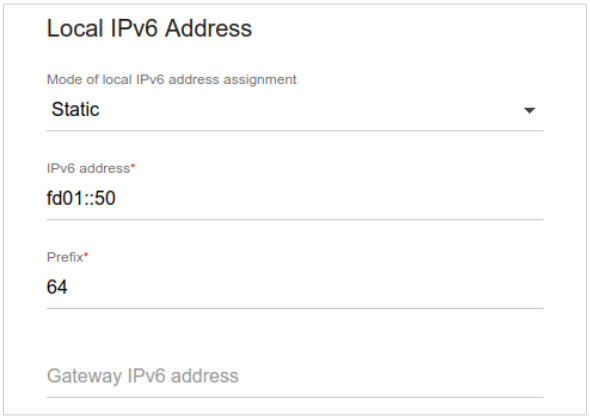


*Figure 36. Configuring the local interface. The **IPv6** tab. The **Local IPv6 Address** section.*

Parameter	Description
Local IPv6 Address	
Mode of local IPv6 address assignment	Select the needed value from the drop-down list. **Static**: an IPv6 address and a prefix are specified manually. **Dynamic**: the extender requests a prefix to configure an IPv6 address from a delegating router.
IPv6 address	The IPv6 address of the extender in the local subnet. By default, the following value is specified: `fd01::50`. The field is available for editing, if the **Static** value is selected from the **Mode of local IPv6 address assignment** drop-down list.
Prefix	The length of the prefix subnet. By default, the value `64` is specified. The field is available for editing, if the **Static** value is selected from the **Mode of local IPv6 address assignment** drop-down list.
Gateway IPv6 address	The gateway IPv6 address which is used by the extender to connect to the Internet (e.g., for synchronizing the system time with an NTP server). *Optional*.

When all needed settings are configured, click the **APPLY** button.

Wi-Fi

In this menu you can specify all needed settings for your wireless network.

Basic Settings

In the **Wi-Fi / Basic Settings** section, you can change basic parameters for the wireless interface of the extender and configure the basic and additional wireless networks. To configure the 2.4GHz band or 5GHz band, go to the relevant tab.

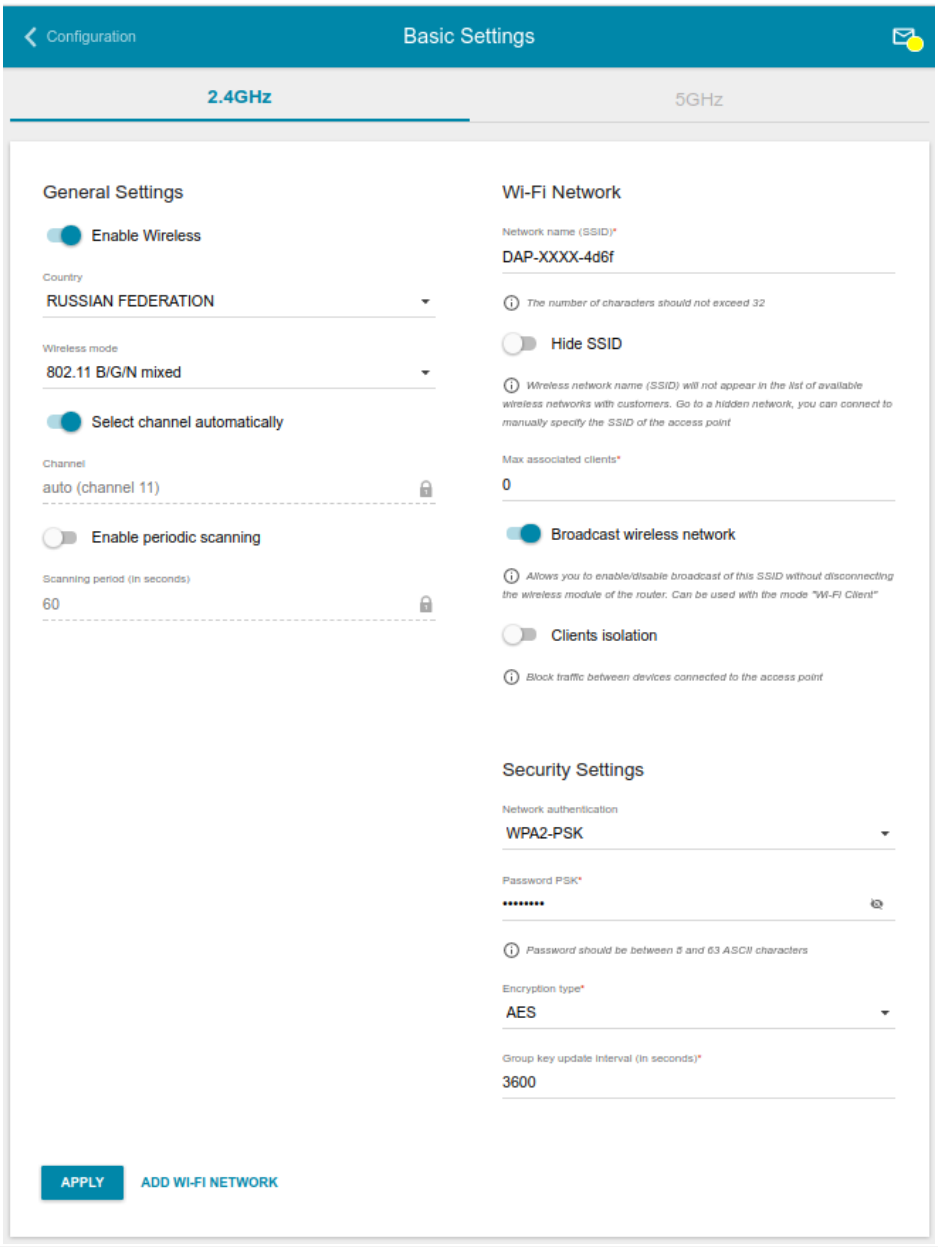


Figure 37. Basic settings of the wireless LAN.

In the **General Settings** section, the following parameters are available:

Parameter	Description
Enable Wireless	To enable Wi-Fi connection, move the switch to the right. To disable Wi-Fi connection, move the switch to the left.
Country	The country you are in. Select a value from the drop-down list.
Wireless mode	Operating mode of the wireless network of the extender. This parameter defines standards of the devices that will be able to use your wireless network. Select a value from the drop-down list.
Select channel automatically	Move the switch to the right to let the extender itself choose the channel with the least interference.
Enable additional channels	*Available on the **5GHz** tab.* If the switch is moved to the left, the device automatically selects one of available standard channels (below the 100th). To use additional channels (the 100th and higher), move the switch to the right.
Channel	The wireless channel number. Left-click to open the window for selecting a channel (the action is available, when the **Select channel automatically** switch is moved to the left).
Enable periodic scanning	Move the switch to the right to let the extender search for a free channel in certain periods of time. When the switch is moved to the right, the **Scanning period** field is available for editing.
Scanning period	Specify a period of time (in seconds) after which the extender rescans channels.

When you have configured the parameters, click the **APPLY** button.

To edit the settings of the basic wireless network, in the **Wi-Fi Network** section, change the needed parameters and click the **APPLY** button.

Also you can create an additional wireless network. To do this, click the **ADD WI-FI NETWORK** button. On the opened page, specify the relevant parameters.

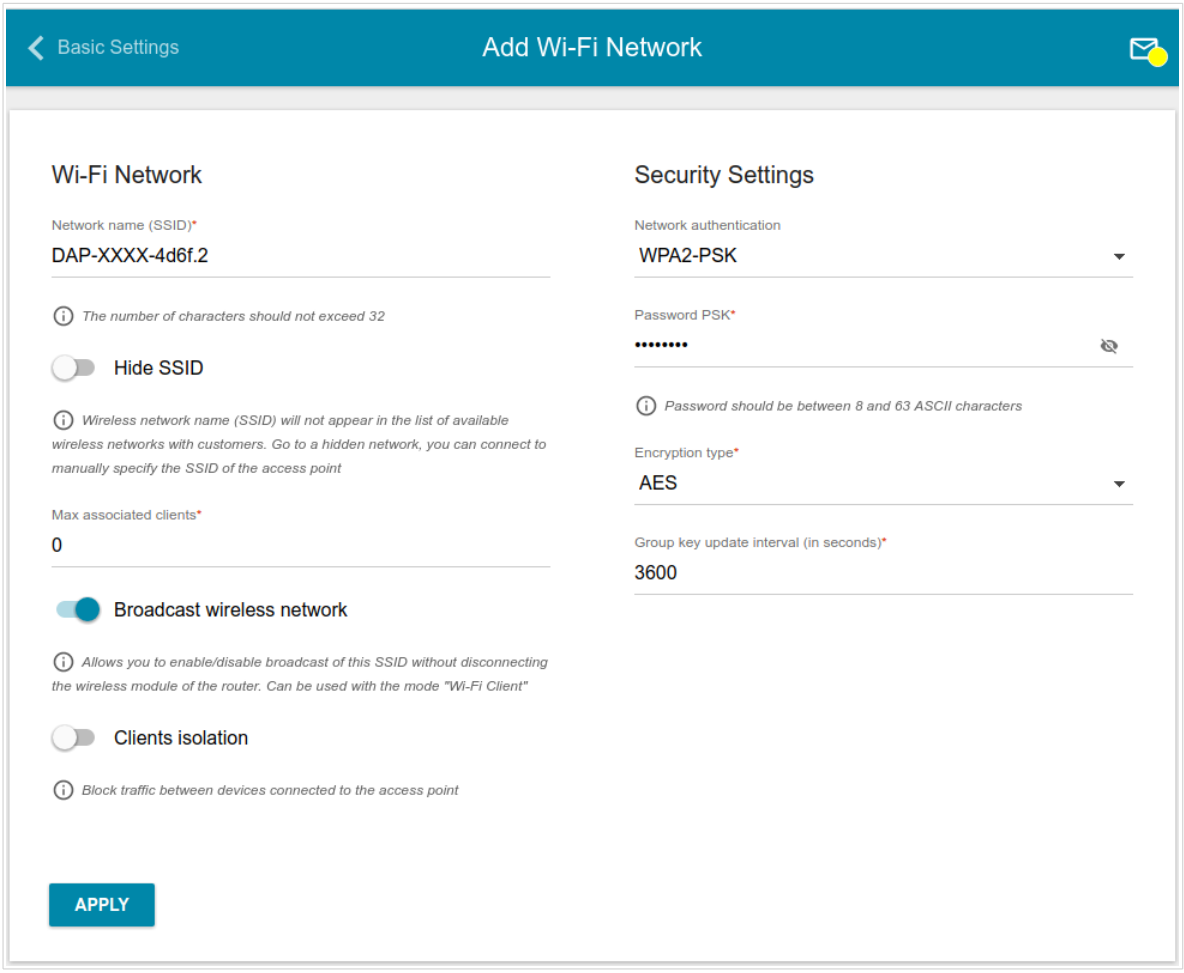


Figure 38. Creating a wireless network.

Parameter	Description
Wi-Fi Network	
Network name (SSID)	A name for the wireless network. The name can consist of digits and Latin characters.
Hide SSID	If the switch is moved to the right, other users cannot see your Wi-Fi network. It is recommended not to hide the network in order to simplify initial configuration of the wireless network.
BSSID	The unique identifier for this wireless network. You cannot change the value of this parameter, it is determined in the device's internal settings. The field is displayed in the settings of the existing wireless network.
Max associated clients	The maximum number of devices connected to the wireless network. When the value `0` is specified, the device does not limit the number of connected clients.
Broadcast wireless network	If the switch is moved to the left, devices cannot connect to the wireless network. Upon that the extender can connect to another access point as a wireless client.
Clients isolation	Move the switch to the right to forbid wireless clients of this wireless network to communicate to each other.

In the **Security Settings** section, you can change security settings of the wireless network.

By default, the **WPA2-PSK** network authentication type of the wireless network is specified. WPS PIN from the barcode label is used as the network key.

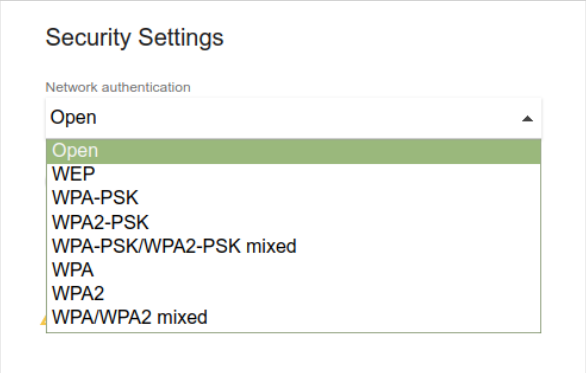


Figure 39. Network authentication types supported by the extender.

The extender supports the following authentication types:

Authentication type	Description
Open	Open authentication (with WEP encryption for wireless network modes not supporting 802.11n or 802.11ac devices).
WEP	Shared key authentication with WEP encryption. This authentication type is not available when on the **Wi-Fi / Basic settings** page of the relevant band, in the **Wireless mode** drop-down list, a mode supporting 802.11n and ac devices is selected.
WPA	WPA-based authentication using a RADIUS server.
WPA-PSK	WPA-based authentication using a PSK.
WPA2	WPA2-based authentication using a RADIUS server.
WPA2-PSK	WPA2-based authentication using a PSK.
WPA/WPA2 mixed	A mixed type of authentication. When this value is selected, devices using the **WPA** authentication type and devices using the **WPA2** authentication type can connect to the wireless network.
WPA-PSK/WPA2-PSK mixed	A mixed type of authentication. When this value is selected, devices using the **WPA-PSK** authentication type and devices using the **WPA2-PSK** authentication type can connect to the wireless network.

! The **WPA**, **WPA2**, and **WPA/WPA2 mixed** authentication types require a RADIUS server.

When the **Open** or **WEP** value is selected, the following settings are displayed on the page (unavailable for the wireless network operating modes which support the standard 802.11n or 802.11ac):

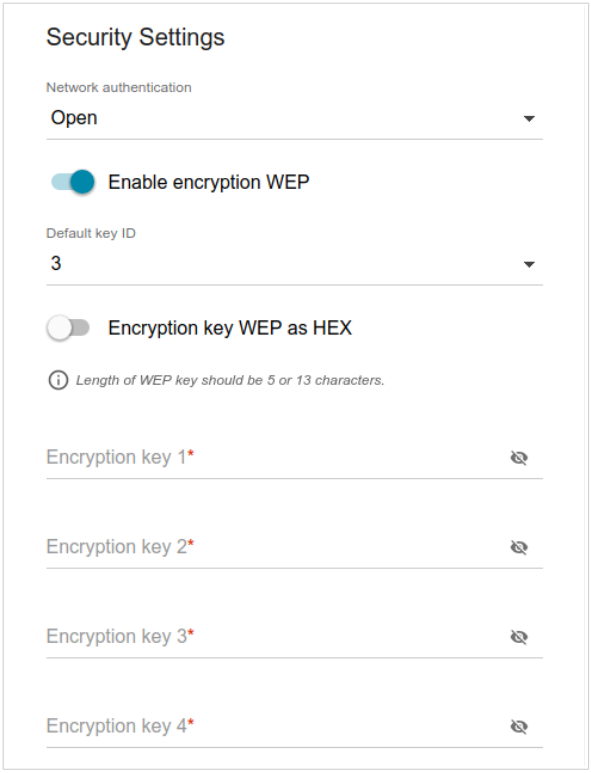


*Figure 40. The **Open** value is selected from the **Network authentication** drop-down list.*

Parameter	Description
Enable encryption WEP	*For **Open** authentication type only.* To activate WEP encryption, move the switch to the right. Upon that the **Default key ID** drop-down list, the **Encryption key WEP as HEX** switch, and four **Encryption key** fields are displayed on the page.
Default key ID	The number of the key (from first to fourth) which will be used for WEP encryption.
Encryption key WEP as HEX	Move the switch to the right to set a hexadecimal number as a key for encryption.
Encryption key (1-4)	Keys for WEP encryption. The extender uses the key selected from the **Default key ID** drop-down list. It is required to specify all the fields. Click the **Show** icon ( ) to display the entered key.

When the **WPA-PSK**, **WPA2-PSK**, or **WPA-PSK/WPA2-PSK mixed** value is selected, the following fields are displayed on the page:

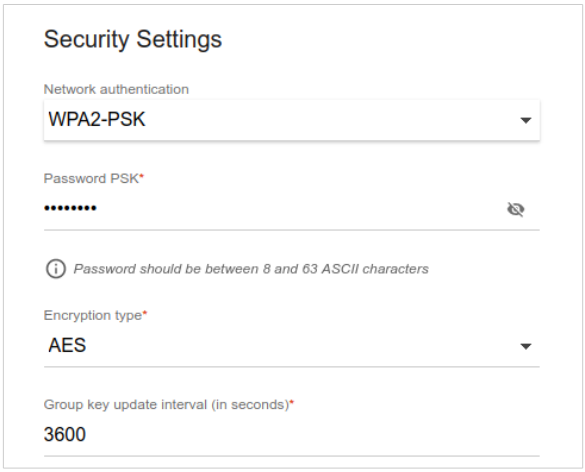


*Figure 41. The **WPA2-PSK** value is selected from the **Network authentication** drop-down list.*

Parameter	Description
Password PSK	A password for WPA encryption. The password can contain digits, Latin letters (uppercase and/or lowercase), and other characters available in the US keyboard layout.[3] Click the **Show** icon ( ) to display the entered password.
Encryption type	An encryption method: **TKIP**, **AES**, or **TKIP+AES**.
Group key update interval	The time period (in seconds), at the end of which a new key for WPA encryption is generated. When the value **0** is specified for this field, the key is not renewed.

3 0-9, A-Z, a-z, space, !"#$%&'()*+,-./:;<=>?@[\]^_`{|}~.

When the **WPA**, **WPA2**, or **WPA/WPA2 mixed** value is selected, the following settings are displayed on the page:

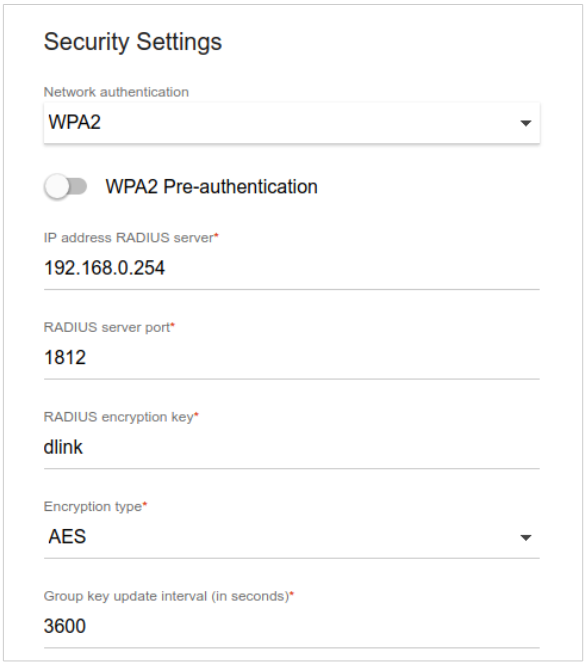


*Figure 42. The **WPA2** value is selected from the **Network authentication** drop-down list.*

Parameter	Description
WPA2 Pre-authentication	Move the switch to the right to activate preliminary authentication (displayed only for the **WPA2** and **WPA/WPA2 mixed** authentication types).
IP address RADIUS server	The IP address of the RADIUS server.
RADIUS server port	A port of the RADIUS server.
RADIUS encryption key	The password which the extender uses for communication with the RADIUS server (the value of this parameter is specified in the RADIUS server settings).
Encryption type	An encryption method: **TKIP**, **AES**, or **TKIP+AES**.
Group key update interval	The time period (in seconds), at the end of which a new key for WPA encryption is generated. When the value `0` is specified for this field, the key is not renewed.

When you have configured the parameters, click the **APPLY** button.

Client Management

On the **Wi-Fi / Client Management** page, you can view the list of wireless clients connected to the extender.

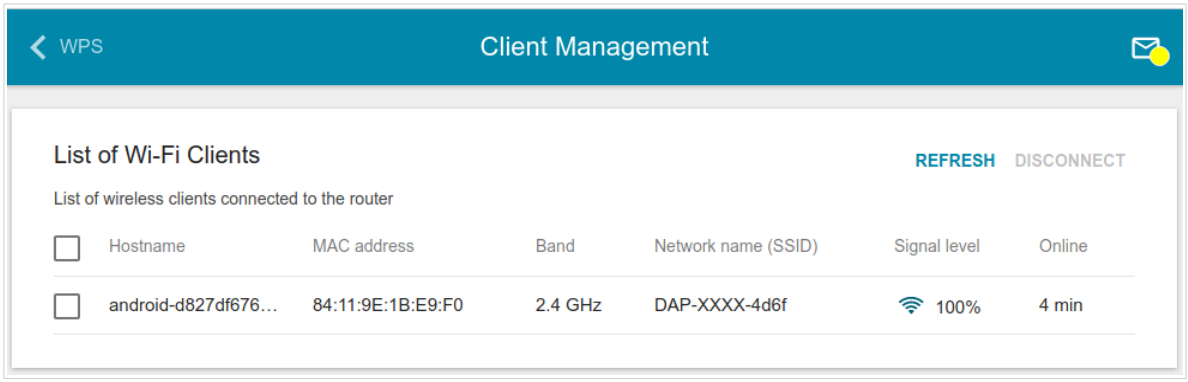


Figure 43. The page for managing the wireless clients.

If you want to disconnect a wireless device from your WLAN, select the checkbox in the line containing the MAC address of this device and click the **DISCONNECT** button.

To view the latest data on the devices connected to the WLAN, click the **REFRESH** button.

WPS

On the **Wi-Fi / WPS** page, you can enable the function for configuration of the WLAN and select a method for connection to the WLAN.

The WPS function helps to configure the protected wireless network automatically. Devices connecting to the wireless network via the WPS function must support the WPS function.

! The WPS function allows adding devices only to the basic wireless network of the extender.

! Before using the function you need to configure one of the following authentication types: **Open** with no encryption, **WPA-PSK** or **WPA2-PSK** with the **AES** encryption method, **WPA-PSK/WPA2-PSK mixed** with the **AES** or **TKIP+AES** encryption method. When other security settings are specified, controls of the **WPS** page are not available.

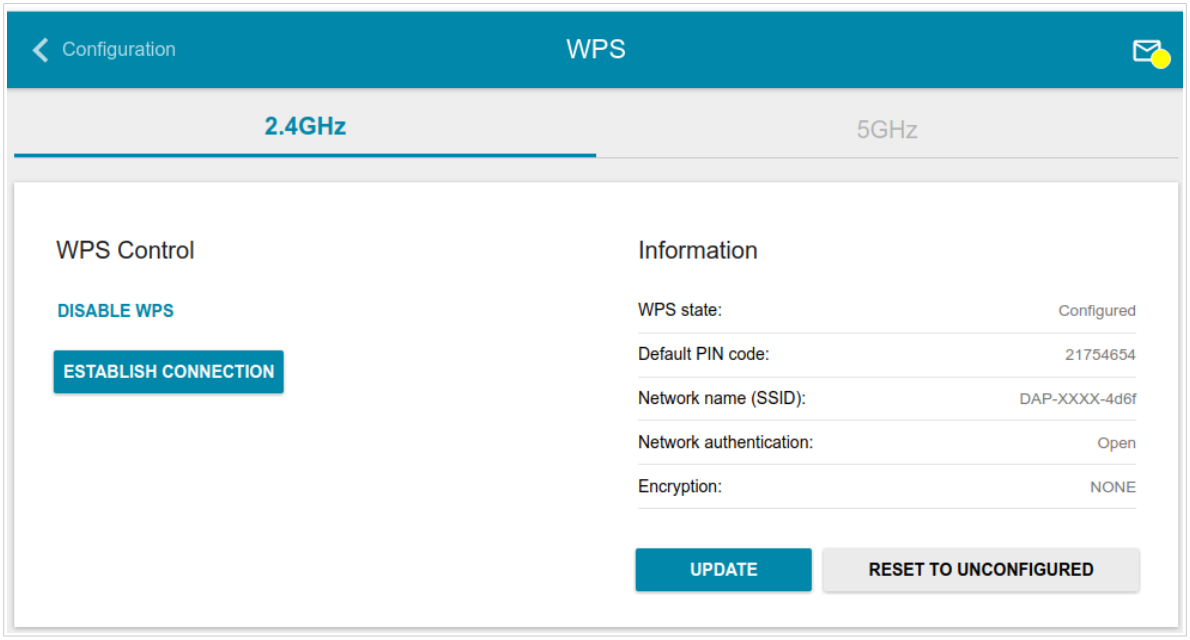


Figure 44. The page for configuring the WPS function.

To activate the WPS function, on the tab of the relevant band, click the **ENABLE WPS** button.

When the WPS function is enabled, the **Information** section is available on the page.

Parameter	Description
WPS state	The state of the WPS function: • **Configured** (all needed settings are specified; these settings will be used upon establishing the wireless connection) • **Unconfigured** (after activating the WPS function, the SSID and the encryption key will be configured automatically, the network authentication type will be changed to WPA2-PSK).
Default PIN code	The PIN code of the extender. This parameter is used when connecting the extender to a registrar to set the parameters of the WPS function.
Network name (SSID)	The name of the extender's wireless network.
Network Authentication	The network authentication type specified for the wireless network.
Encryption	The encryption type specified for the wireless network.
Password PSK	The encryption password specified for the wireless network.
UPDATE	Click the button to update the data on the page.
RESET TO UNCONFIGURED	Click the button to reset the parameters of the WPS function.

Using WPS Function via Web-based Interface

To connect to the basic wireless network via the PIN method of the WPS function, follow the next steps:

1. Move the **Enable WPS** switch to the right.
2. In the **WPS Control** section, click the **ESTABLISH CONNECTION** button.
3. In the opened window, select the **PIN** value from the **WPS method** drop-down list.
4. Select the PIN method in the software of the wireless device that you want to connect to the extender's WLAN.
5. Click the relevant button in the software of the wireless device that you want to connect to the WLAN.
6. Right after that, enter the PIN code specified on the cover of the wireless device or in its software in the **PIN Code** field.
7. Click the **CONNECT** button in the web-based interface of the extender.

To connect to the basic wireless network via the PBC method of the WPS function, follow the next steps:

1. Move the **Enable WPS** switch to the right.
2. In the **WPS Control** section, click the **ESTABLISH CONNECTION** button.
3. In the opened window, select the **PBC** value from the **WPS method** drop-down list.
4. Select the PBC method in the software of the wireless device that you want to connect to the extender's WLAN.
5. Click the relevant button in the software or press the WPS button on the cover of the wireless device that you want to connect to the WLAN.
6. Right after that, click the **CONNECT** button in the web-based interface of the extender.

Using WPS Function without Web-based Interface

You can use the WPS function without accessing the web-based interface of the extender. To do this, you need to configure the following extender's settings:

1. Specify relevant security settings for the wireless network of the extender.
2. Move the **WPS Enable** switch to the right.
3. Save the settings and close the web-based interface (click the **SAVE** button in the notification and then click the **Logout** line of the menu).

Later you will be able to add wireless devices to the WLAN by pressing the **WPS** button of the extender.

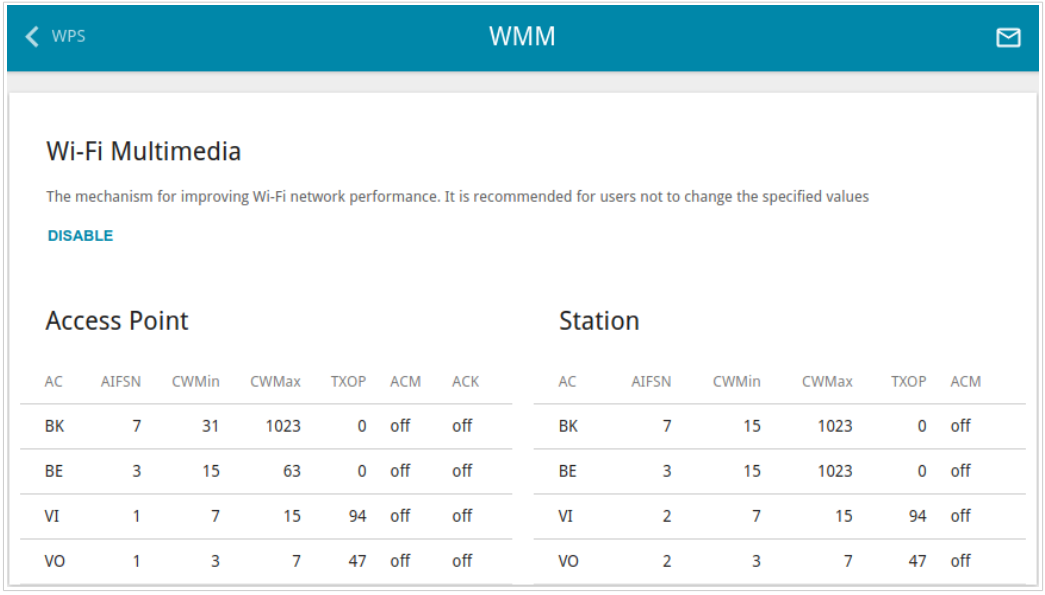
1. Select the PBC method in the software of the wireless device that you want to connect to the extender's WLAN.
2. Click the relevant button in the software or press the WPS button on the cover of the wireless device that you want to connect to the WLAN.
3. Press the **WPS** button of the extender, hold it for 2 seconds, and release. The **POWER/WPS** LED will start blinking.

WMM

On the **Wi-Fi / WMM** page, you can enable the Wi-Fi Multimedia function.

The WMM function implements the QoS features for Wi-Fi networks. It helps to improve the quality of data transfer over Wi-Fi networks by prioritizing different types of traffic.

To enable the function, click the **ENABLE** button. Upon that the **Access Point** and **Station** sections are displayed on the page.



AC	AIFSN	CWMin	CWMax	TXOP	ACM	ACK
BK	7	31	1023	0	off	off
BE	3	15	63	0	off	off
VI	1	7	15	94	off	off
VO	1	3	7	47	off	off

AC	AIFSN	CWMin	CWMax	TXOP	ACM
BK	7	15	1023	0	off
BE	3	15	1023	0	off
VI	2	7	15	94	off
VO	2	3	7	47	off

Figure 45. The page for configuring the WMM function.

! All needed settings for the WMM function are specified in the device's system. It is recommended not to change the default values.

The WMM function allows assigning priorities for four Access Categories (AC):

- **BK** (*Background*), low priority traffic (print jobs, file downloads, etc.).
- **BE** (*Best Effort*), traffic from legacy devices or devices/applications that do not support QoS.
- **VI** (*Video*).
- **VO** (*Voice*).

Parameters of the Access Categories are defined for both the extender itself (in the **Access Point** section) and wireless devices connected to it (in the **Station** section).

To edit the parameters of an Access Category, left-click the relevant line. In the opened window, change the needed parameters.

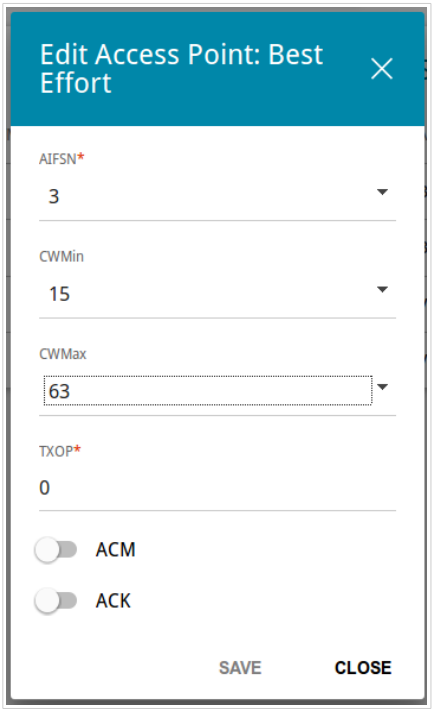


Figure 46. The window for changing parameters of the WMM function.

Parameter	Description
AIFSN	*Arbitrary Inter-Frame Space Number*. This parameter influences time delays for the relevant Access Category. The lower the value, the higher is the Access Category priority.
CWMin/CWMax	*Contention Window Minimum/Contention Window Maximum*. Both fields influence time delays for the relevant Access Category. The **CWMax** field value should not be lower, than the **CWMin** field value. The lower the difference between the **CWMax** field value and the **CWMin** field value, the higher is the Access Category priority.
TXOP	*Transmission Opportunity*. The higher the value, the higher is the Access Category priority.
ACM	*Admission Control Mandatory*. If the switch is moved to the right, the device cannot use the relevant Access Category.
ACK	*Acknowledgment*. Answering response requests while transmitting. Displayed only in the **Access Point** section. If the switch is moved to the left, the extender answers requests. If the switch is moved to the right, the extender does not answer requests.

Click the **SAVE** button.

To disable the WMM function, click the **DISABLE** button.

Client

On the **Wi-Fi / Client** page, you can configure the extender as a client to connect to a wireless access point. To configure the 2.4GHz band or 5GHz band, go to the relevant tab.

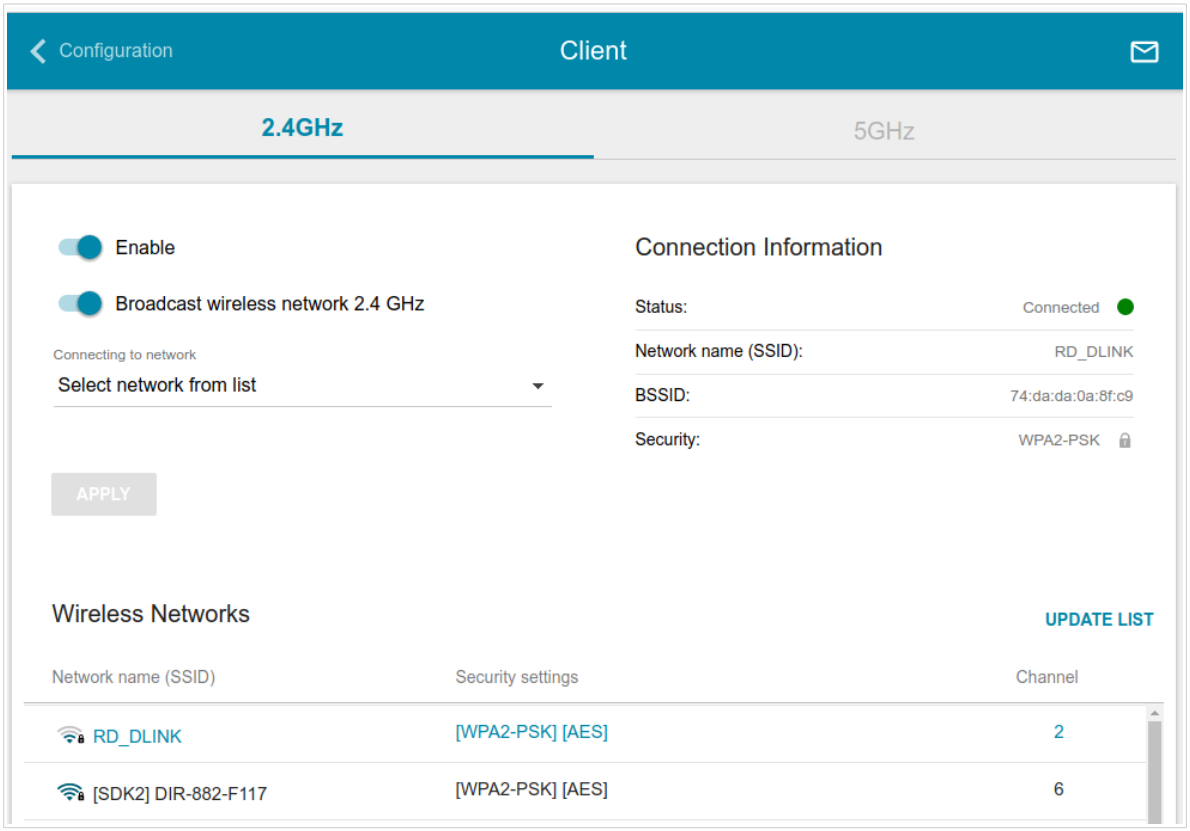


Figure 47. The page for configuring the client mode.

To configure the extender as a client, move the **Enable** switch to the right. Upon that the following fields are displayed on the page:

Parameter	Description
Broadcast wireless network 2.4 GHz / Broadcast wireless network 5 GHz	If the switch is moved to the left, devices cannot connect to the extender's WLAN. Upon that the extender can connect to another access point as a wireless client.
Connecting to network	A method for connecting to another access point.

In the **Wireless Networks** section, the list of available wireless networks is displayed. To view the latest data on available wireless networks, click the **UPDATE LIST** button.

To connect to a wireless network from the list, select the needed network. Move the **Network options** switch to the right to view more detailed information on the network to which the extender connects. If a password is required, enter it in the relevant field. Click the **CONNECT** button.

To connect to a hidden network, select the **Connect to hidden network** value from the **Connecting to network** drop-down list. Enter the name of the network in the **Network name (SSID)** field. If needed, fill in the **BSSID** field. Then select the needed type of authentication from the **Network authentication** drop-down list.

When the **Open** or **WEP** authentication type is selected, the following settings are displayed on the page:

Parameter	Description
Enable encryption WEP	*For **Open** authentication type only.* To activate WEP encryption, move the switch to the right. Upon that the **Default key ID** drop-down list, the **Encryption key WEP as HEX** switch, and four **Encryption key** fields are displayed on the page.
Default key ID	The number of the key (from first to fourth) which will be used for WEP encryption.
Encryption key WEP as HEX	Move the switch to the right to set a hexadecimal number as a key for encryption.
Encryption key (1-4)	Keys for WEP encryption. The extender uses the key selected from the **Default key ID** drop-down list. It is required to specify all the fields. Click the **Show** icon ( ) to display the entered key.

When the **WPA-PSK**, **WPA2-PSK**, or **WPA-PSK/WPA2-PSK mixed** authentication type is selected, the following fields are displayed:

Parameter	Description
Password PSK	A password for WPA encryption. Click the **Show** icon ( ) to display the entered password.
Encryption type	An encryption method: **TKIP**, **AES**, or **TKIP+AES**.

When the **WPA**, **WPA2**, or **WPA/WPA2 mixed** authentication type is selected, the following fields are displayed:

Parameter	Description
RADIUS server login	The username of the account on the RADIUS server.
RADIUS server password	The password of the account on the RADIUS server. Click the **Show** icon ( ) to display the entered password.
Encryption type	An encryption method: **AES**.

When you have configured the parameters, click the **APPLY** button.

When connecting to a wireless access point, the wireless channel of DAP-1610 will switch to the channel of the access point to which you have connected.

If the extender has been successfully connected to the network, the line of the selected network will be highlighted in blue.

In addition, the **Connection Information** section in which you can view the connection status and the network basic parameters is displayed.

Additional

On page of the **Wi-Fi / Additional** section, you can define additional parameters for the WLAN of the extender. To configure the 2.4GHz band or 5GHz band, go to the relevant tab.

Changing parameters presented on this page may negatively affect your WLAN!

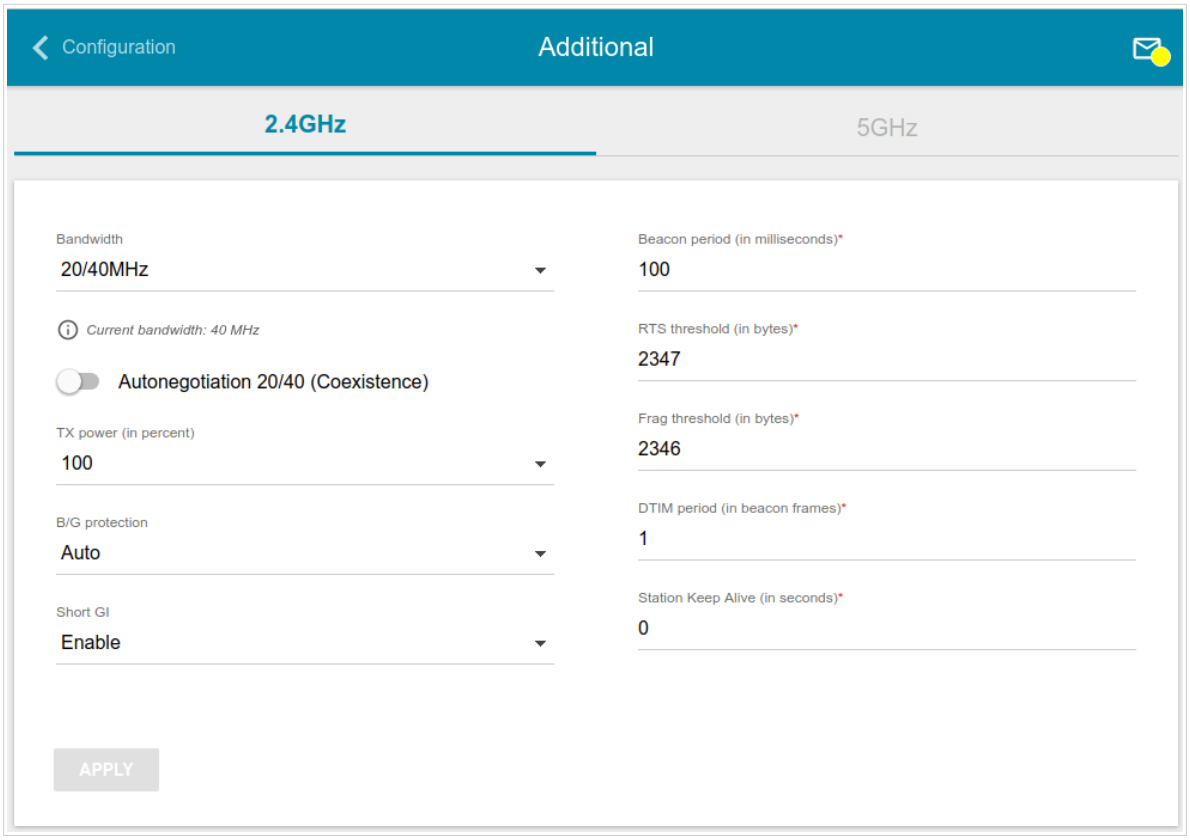


Figure 48. Additional settings of the WLAN.

The following fields are available on the page:

Parameter	Description
Bandwidth	The channel bandwidth for 802.11n standard in the 2.4GHz band (the **2.4GHz** tab). **20MHz**: 802.11n clients operate at 20MHz channels. **20/40MHz**: 802.11n clients operate at 20MHz or 40MHz channels. The channel bandwidth for 802.11n and 802.11ac standards in 5GHz band (the **5GHz** tab). **20MHz**: 802.11n and 802.11ac clients operate at 20MHz channels. **20/40MHz**: 802.11n and 802.11ac clients operate at 20MHz or 40MHz channels. **20/40/80MHz**: 802.11ac clients operate at 20MHz, 40MHz, or 80MHz channels.
Autonegotiation 20/40 (Coexistence)	*Available on the **2.4GHz** tab.* Move the switch to the right to let the extender to automatically choose the most suitable channel bandwidth (20MHz or 40MHz) for the connected devices (this setting can substantially lower the data transfer rate of your wireless network).
TX power	The transmit power (in percentage terms) of the extender.
B/G protection	*Available on the **2.4GHz** tab.* The 802.11b and 802.11g protection function is used to minimize collisions between devices of your wireless network. Select a value from the drop-down list. **Auto**: The protection function is enabled and disabled automatically depending on the state of the network (this value is recommended if your wireless local area network consists of both 802.11b and 802.11g devices). **Always On**: The protection function is always enabled (this setting can substantially lower the efficiency of your wireless network). **Always Off**: The protection function is always disabled.
Short GI	Guard interval (in nanoseconds). This parameter defines the interval between symbols transmitted when the extender is communicating to wireless devices. **Enable**: the extender uses the 400 ns short guard interval. Only for the wireless network operating modes which support 802.11n and 802.11ac standard (see the value of the **Wireless mode** drop-down list on the **Wi-Fi / Basic Settings** page). **Disable**: the extender uses the 800 ns standard guard interval.

Parameter	Description
Beacon period	The time interval (in milliseconds) between packets sent to synchronize the wireless network.
RTS threshold	The minimum size (in bytes) of a packet for which an RTS frame is transmitted.
Frag threshold	The maximum size (in bytes) of a non-fragmented packet. Larger packets are fragmented (divided).
DTIM period	The time period (in beacon frames) between sending a DTIM (a message notifying on broadcast or multicast transmission) and data transmission.
Station Keep Alive	The time interval (in seconds) between keep alive checks of wireless devices connected to the extender. When the value **0** is specified, the checking is disabled.

When you have configured the parameters, click the **APPLY** button.

MAC Filter

On the **Wi-Fi / MAC Filter** page, you can define a set of MAC addresses of devices which will be allowed to access the WLAN, or define MAC addresses of devices which will not be allowed to access the WLAN.

It is recommended to configure the Wi-Fi MAC filter through a wired connection to DAP-1610.

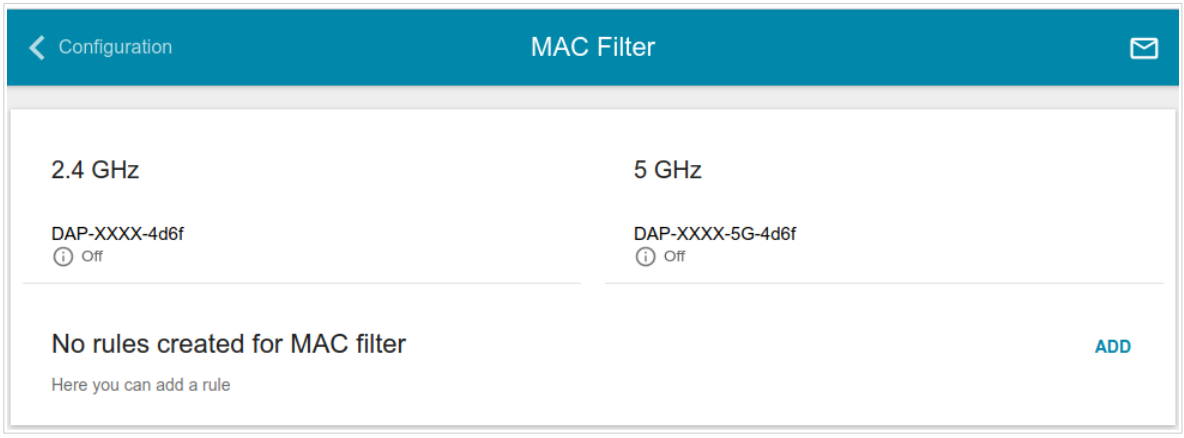


Figure 49. The page for configuring the MAC filter for the wireless network.

By default, the Wi-Fi MAC filter is disabled.

To configure the MAC filter, first you need to create rules (specify MAC addresses of devices for which the specified filtering modes will be applied). To do this, click the **ADD** button.

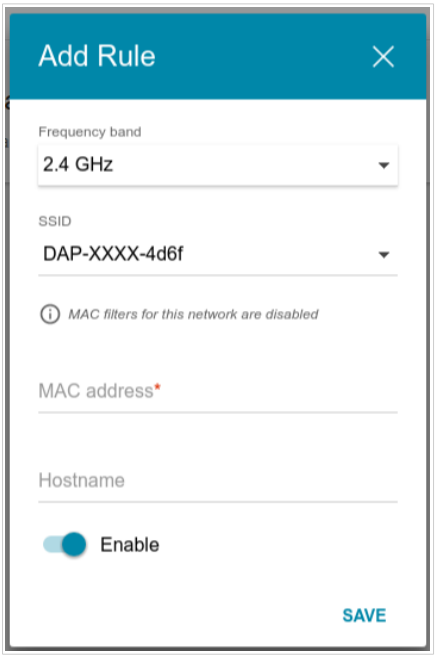


Figure 50. The window for adding a rule for the MAC filter.

You can specify the following parameters:

Parameter	Description
Frequency band	From the drop-down list, select a band of the wireless network.
SSID	A wireless network to which the rule will be applied. Select the needed value from the drop-down list.
MAC address	In the field, enter the MAC address to which the selected filtering mode will be applied.
Hostname	The name of the device for easier identification. You can specify any name.
Enable	If the switch is moved to the right, the rule is active. Move the switch to the left to disable the rule.

When you have configured the parameters, click the **SAVE** button.

To edit the parameters of the existing rule, in the **Filters** section, left-click the needed rule. In the opened window, change the settings and click the **SAVE** button.

To remove the rule from the page, in the **Filters** section, select the checkbox located to the left of the relevant rule and click the **DELETE** button.

After creating the rules you need to configure the filtering modes.

To open the basic or additional wireless network for the devices which MAC addresses are specified on this page and to close the wireless network for all other devices, in the section corresponding to the band (**2.4 GHz** or **5 GHz**), left-click the line of the wireless network. In the opened window, move the **Enable MAC filter** switch to the right. Upon that the **MAC filter restrict mode** drop-down list will be displayed. Select the **Allow** value from the drop-down list and click the **SAVE** button.

To close the wireless network for the devices which MAC addresses are specified on this page, select the **Deny** value from the **MAC filter restrict mode** drop-down list and click the **SAVE** button.

Roaming

On the **Wi-Fi / Roaming** page, you can enable the function of smart adjustment of Wi-Fi clients.

This function is designed for wireless networks based on several access points or routers. If the function is enabled for all access points (routers, extenders) which establish a wireless network, then wireless clients will always connect to the device with the highest signal level.

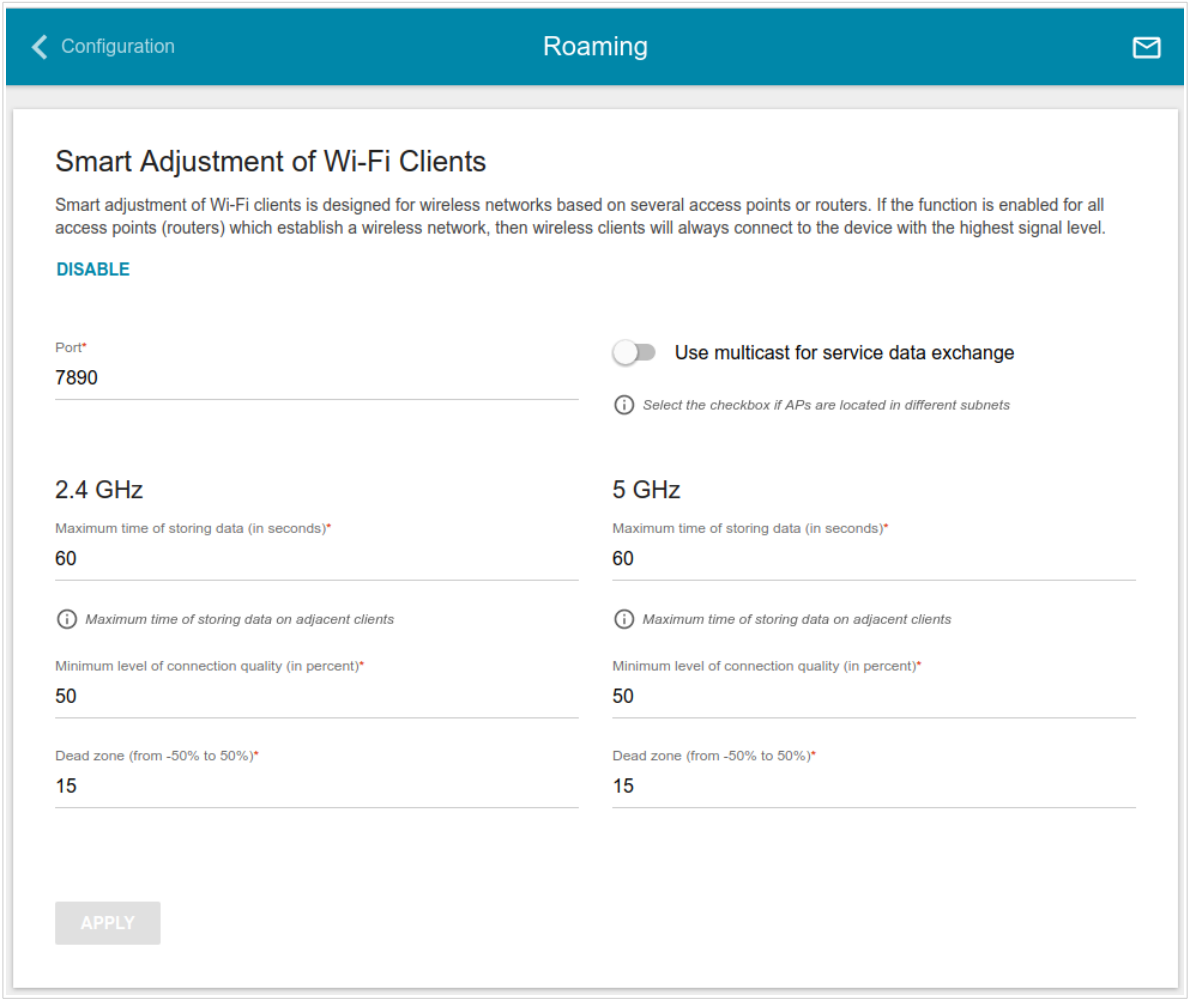


*Figure 51. The **Wi-Fi / Roaming** page.*

To enable the function, click the **ENABLE** button. Upon that the following settings are available on the page.

Parameter	Description
Port	The number of the port used for data exchange between access points (routers, extenders).
Use multicast for service data exchange	Move the switch to the right in order to use multicast traffic for service data exchange between access points (routers, extenders). This setting is needed if the devices which support the smart adjustment function are located in different subnets. If the switch is moved to the right, the **Multicast TTL** and **Multicast group address** fields are displayed on the page. If the switch is moved to the left, broadcast traffic is used for service data exchange.
Multicast TTL	Specify the TTL (*Time to live*) parameter value. The recommended value is `4`.
Multicast group address	Specify the address of the multicast group (from the subnet 239.255.0.0/16).
2.4 GHz / 5 GHz	
Maximum time of storing data	The maximum time period (in seconds) during which the access point (extender) stores data on the signal strength of the client located on its coverage area.
Minimum level of connection quality	The threshold value of the signal strength upon which the access point (extender) starts scanning other devices.
Dead zone	This parameter is used for calculation of the signal strength upon which the smart adjustment function goes off. If the signal strength provided by the device is less than the sum of the **Minimum level of connection quality** field value and the **Dead zone** field value, then the client disconnects from the access point (extender) and connects to another device. You can specify the values from `-50%` to `+50%`.

After specifying the needed parameters, click the **APPLY** button.

To disable the function of smart adjustment of Wi-Fi clients, click the **DISABLE** button.

Advanced

In this menu you can add name servers and also configure autonegotiation or manually configure speed and duplex mode for the Ethernet port of the extender.

DNS

On the **Advanced / DNS** page, you can add DNS servers to the system.

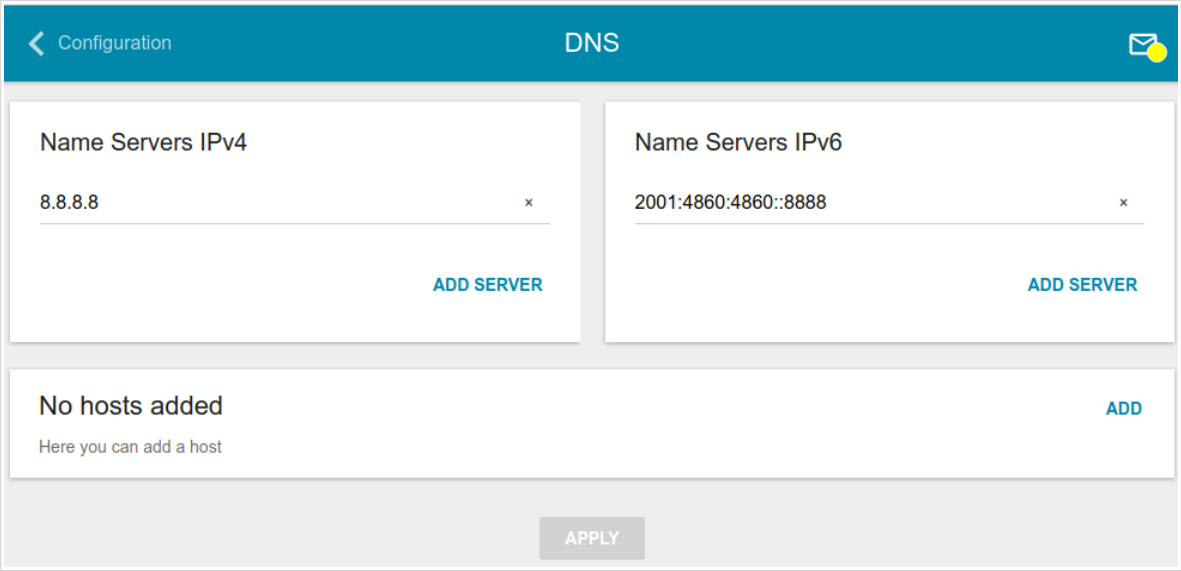


*Figure 52. The **Advanced / DNS** page.*

DNS servers are used to determine the IP address from the name of a server in Intranets or the Internet.

On this page, you can specify the addresses of DNS servers manually.

If you want to specify the DNS server, click the **ADD SERVER** button (use the **Name Servers IPv4** section for IPv4 and the **Name Servers IPv6** section for IPv6) and enter a DNS server address. Then click the **APPLY** button.

To remove a DNS server from the page, click the **Delete** icon (×) in the line of the address and then click the **APPLY** button.

If needed, you can add your own address resource record.[4] To do this, click the **ADD** button.

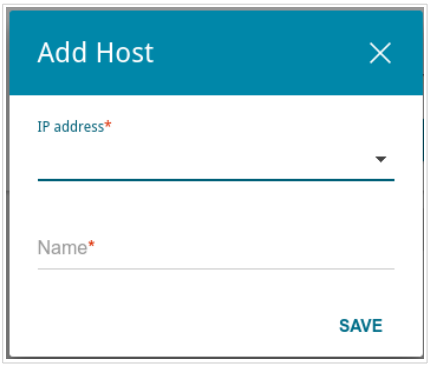


Figure 53. The window for adding a DNS record.

4 You need to specify the IP address of the extender as a DNS server for clients of the DAP-1610 device to allow them to use the records.

In the **IP address** field, specify a host. In the **Name** field, specify the domain name to which the specified IP address will correspond. Click the **SAVE** button.

To edit an existing record, select the relevant line in the table. In the opened window, change the needed parameters and click the **SAVE** button.

To remove a record, select the checkbox located to the left of the relevant line in the table and click the **DELETE** button.

After completing the work with records, click the **APPLY** button.

Ports Settings

On the **Advanced / Ports Settings** page, you can configure or disable autonegotiation of speed and duplex mode or manually configure speed and duplex mode for the Ethernet port of the extender.

Also you can enable or disable data flow control in the autonegotiation mode.

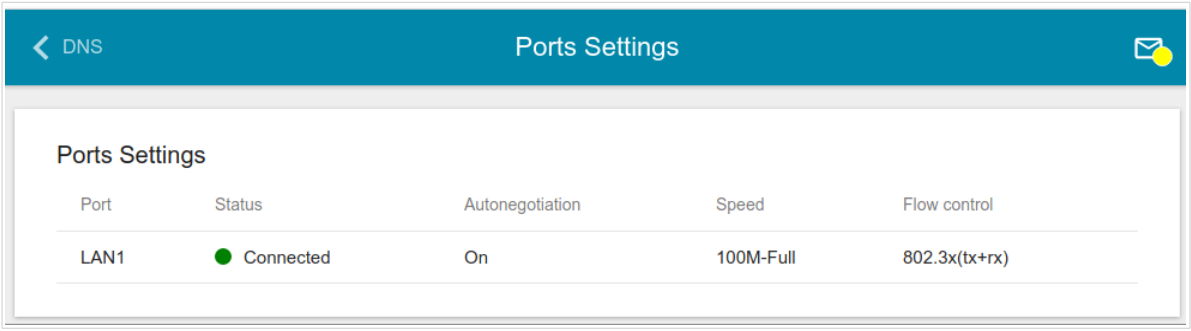


*Figure 54. The **Advanced / Ports Settings** page.*

In order to configure autonegotiation or configure speed and duplex mode manually for the Ethernet port, select it in the table.

Autonegotiation should be enabled for both devices connected to each other.

When autonegotiation is disabled, speed and duplex mode settings for both devices connected to each other should be the same.

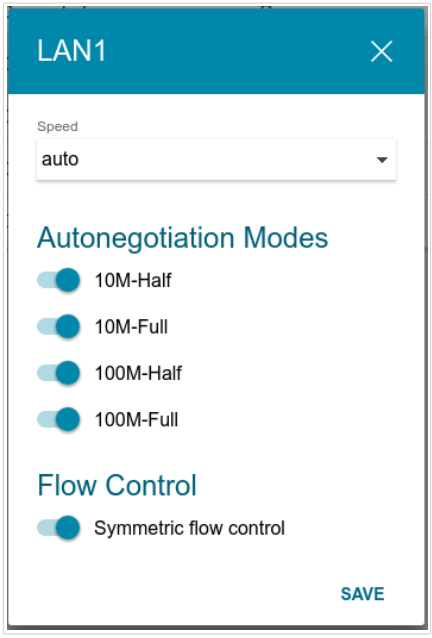


Figure 55. The window for changing the settings of the extender's port.

In the opened window, specify the needed parameters:

Parameter	Description
Speed	Data transfer mode. Select the **auto** value to enable autonegotiation. When this value is selected, the **Autonegotiation Modes** and **Flow Control** sections are displayed. Select the **10M-Half**, **10M-Full**, **100M-Half**, or **100M-Full** value to manually configure speed and duplex mode for the selected port: • **10M-Half**: Data transfer in just one direction at a time (data can be either sent or received) at the maximum possible rate of up to 10Mbps. • **10M-Full:** Data transfer in two directions simultaneously (data can be sent and received at the same time) at the maximum possible rate of up to 10Mbps. • **100M-Half:** Data transfer in just one direction at a time (data can be either sent or received) at the maximum possible rate of up to 100Mbps. • **100M-Full:** Data transfer in two directions simultaneously (data can be sent and received at the same time) at the maximum possible rate of up to 100Mbps.
Autonegotiation modes	
To enable the needed data transfer modes, move relevant switches to the right.	
Flow control	
Symmetric flow control	Move the switch to the right to enable the flow control function for the port. Move the switch to the left to disable the flow control function for the port.

After specifying the needed parameters, click the **SAVE** button.

Firewall

In this menu you can configure the MAC filter of the extender.

MAC Filter

On the **Firewall / MAC Filter** page, you can configure MAC-address-based filtering for devices connected to the extender.

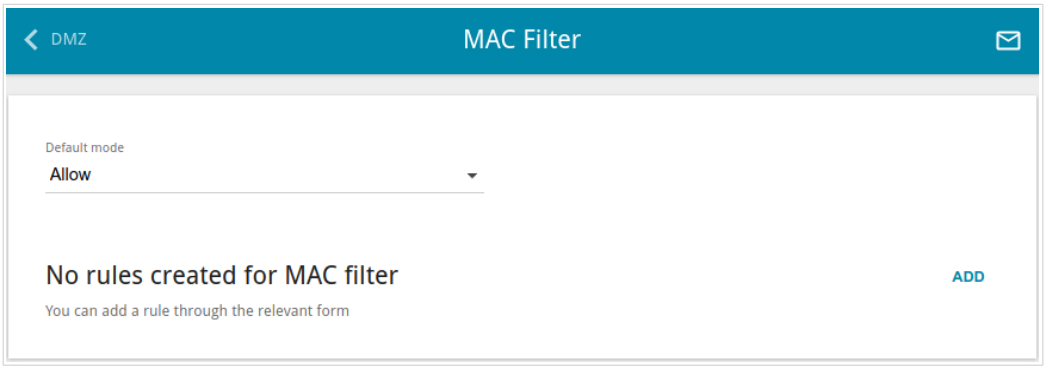


*Figure 56. The **Firewall / MAC Filter** page.*

To allow or block access to the extender or the upper router's network, select the needed action (the **Allow** or **Deny** value correspondingly) from the **Default mode** drop-down list.

> You can use the **Deny** mode only if an active rule which allows access to the extender or the upper device's network is created on the page.

To create a rule (specify a MAC address of a device for which the specified filtering mode will be applied), click the **ADD** button.

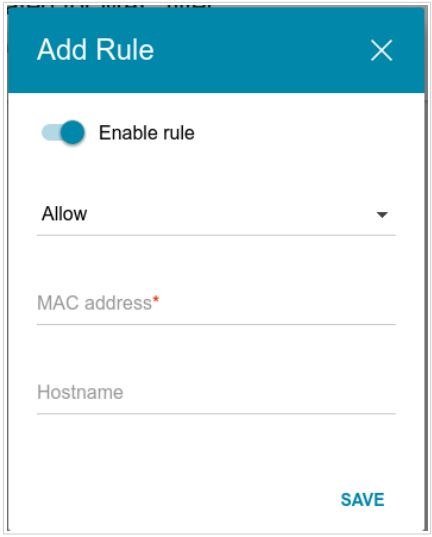


Figure 57. The window for adding a rule for the MAC filter.

In the opened window, you can specify the following parameters:

Parameter	Description
Enable rule	Move the switch to the right to enable the rule. Move the switch to the left to disable the rule.
Action	Select an action for the rule. **Deny**: Blocks access to the extender or the upper router's network for the device with the specified MAC address if the default mode allows access for all devices. **Allow**: Allows access to the extender or the upper router's network for the device with the specified MAC address if the default mode denies access for all devices.
MAC address	The MAC address of a device connected to the extender.
Hostname	The name of the device for easier identification. You can specify any name.

After specifying the needed parameters, click the **SAVE** button.

To edit a rule, select the relevant line in the table. In the opened window, change the needed parameters and click the **SAVE** button.

To remove a rule, select the checkbox located to the left of the relevant line of the table and click the **DELETE** button. Also you can remove a rule in the editing window.

System

In this menu you can do the following:

- change the password used to access the extender's settings
- restore the factory default settings
- create a backup of the extender's configuration
- restore the extender's configuration from a previously saved file
- save the current settings to the non-volatile memory
- reboot the extender
- change the web-based interface language
- update the firmware of the extender
- configure automatic notification on new firmware version
- view the system log; configure sending the system log to a remote host
- check availability of a host on the Internet through the web-based interface of the extender
- trace the route to a host
- allow or forbid access to the extender via TELNET
- configure automatic synchronization of the system time or manually configure the date and time for the extender.

Configuration

On the **System / Configuration** page, you can change the password for the administrator account used to access the web-based interface of the extender and to access the device settings via TELNET, restore the factory defaults, backup the current configuration, restore the extender's configuration from a previously created file, save the changed settings to the non-volatile memory, reboot the device, or change the web-based interface language.

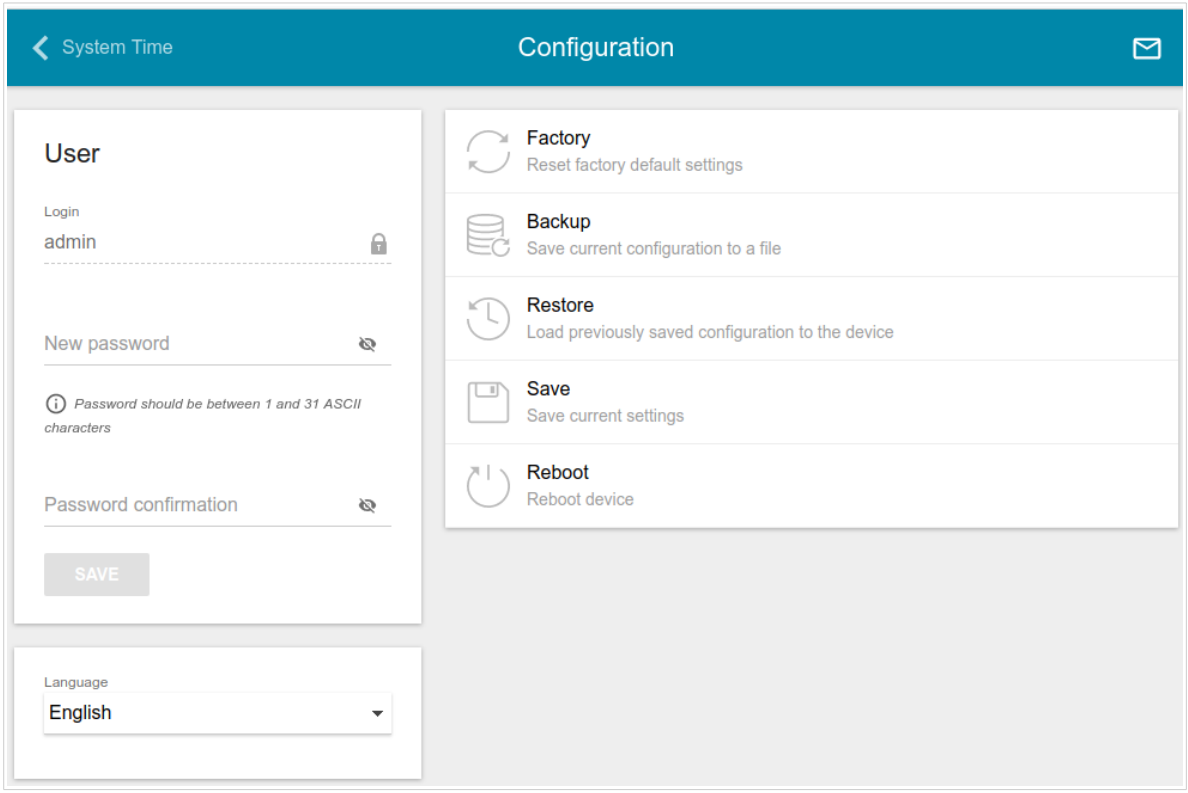


*Figure 58. The **System / Configuration** page.*

In order to change the password for the administrator account, in the **User** section, enter a new password in the **Password** and **Password confirmation** fields. Use digits, Latin letters (uppercase and/or lowercase), and other characters available in the US keyboard layout.[5] Click the **Show** icon ( ) to display the entered values. Then click the **SAVE** button.

! Remember or write down the new password for the administrator account. In case of losing the new password, you can access the settings of the extender only after restoring the factory default settings via the hardware **RESET** button. This procedure wipes out all settings that you have configured for your extender.

To change the web-based interface language, select the needed value from the **Language** drop-down list.

5 0-9, A-Z, a-z, space, !"#$%&'()*+,-./:;<=>?@[\]^_`{|}~.

The following buttons are also available on the page:

Control	Description
Factory	Click the button to restore the factory default settings. Also you can restore the factory defaults via the hardware **RESET** button (see the ***Upper Panel*** section, page 10).
Backup	Click the button to save the configuration (all settings of the extender) to your PC. The configuration backup will be stored in the download location of your web browser.
Restore	Click the button and follow the dialog box appeared to select a previously saved configuration file (all settings of the extender) located on your PC and upload it.
Save	Click the button to save settings to the non-volatile memory. The extender saves changed settings automatically. If changed settings have not been saved automatically, a notification is displayed in the top right part of the page.
Reboot	Click the button to reboot the device. All unsaved changes will be lost after the device's reboot.

Firmware Update

On the **System / Firmware Update** page, you can update the firmware of the extender and configure the automatic check for updates of the extender's firmware.

! Update the firmware only when the extender is connected to your PC via a wired connection.

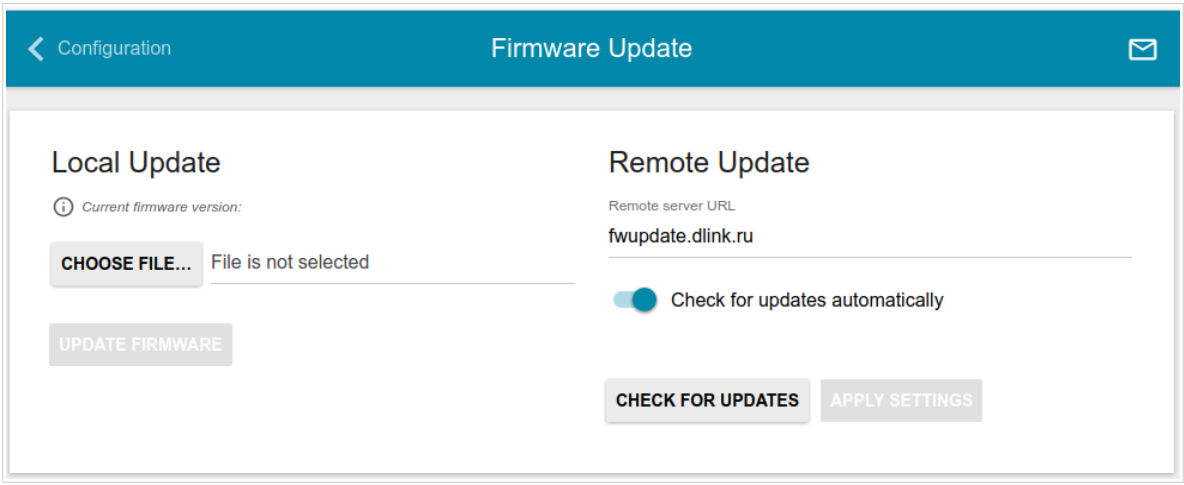


*Figure 59. The **System / Firmware Update** page.*

The current version of the extender's firmware is displayed in the **Current firmware version** field.

By default, the automatic check for the extender's firmware updates is enabled. If a firmware update is available, a notification will be displayed in the top right corner of the page.

To disable the automatic check for firmware updates, in the **Remote update** section, move the **Check for updates automatically** switch to the left and click the **APPLY SETTINGS** button.

To enable the automatic check for firmware updates, in the **Remote update** section, move the **Check for updates automatically** switch to the right and click the **APPLY SETTINGS** button. By default, in the **Remote server URL** field, the D-Link update server address (`fwupdate.dlink.ru`) is specified.

You can update the firmware of the extender locally (from the hard drive of your PC) or remotely (from the update server).

Local Update

Attention! Do not turn off the extender before the firmware update is completed. This may cause the device breakdown.

To update the firmware of the extender locally, follow the next steps:

1. Download a new version of the firmware from www.dlink.ru.
2. Click the **CHOOSE FILE** button in the **Local Update** section on the **System / Firmware Update** page to locate the new firmware file.
3. Click the **UPDATE FIRMWARE** button.
4. Wait until the extender is rebooted (about one and a half or two minutes).
5. Log into the web-based interface using the login (`admin`) and the current password.

If after updating the firmware the extender doesn't work correctly, please restore the factory default settings. To do this, click the **Factory** button on the **System / Configuration** page. Wait until the extender is rebooted.

Remote Update

Attention! Do not turn off the extender before the firmware update is completed. This may cause the device breakdown.

To update the firmware of the extender remotely, follow the next steps:

1. On the **System / Firmware Update** page, in the **Remote Update** section, click the **CHECK FOR UPDATES** button to check if a newer firmware version exists.
2. Click the **UPDATE FIRMWARE** button (the button is displayed if a newer version of the firmware is available).
3. Wait until the extender is rebooted (about one and a half or two minutes).
4. Log into the web-based interface using the login (**admin**) and the current password.

If after updating the firmware the extender doesn't work correctly, please restore the factory default settings. To do this, click the **Factory** button on the **System / Configuration** page. Wait until the extender is rebooted.

Log

On the **System / Log** page, you can set the system log options and configure sending the system log to a remote host.

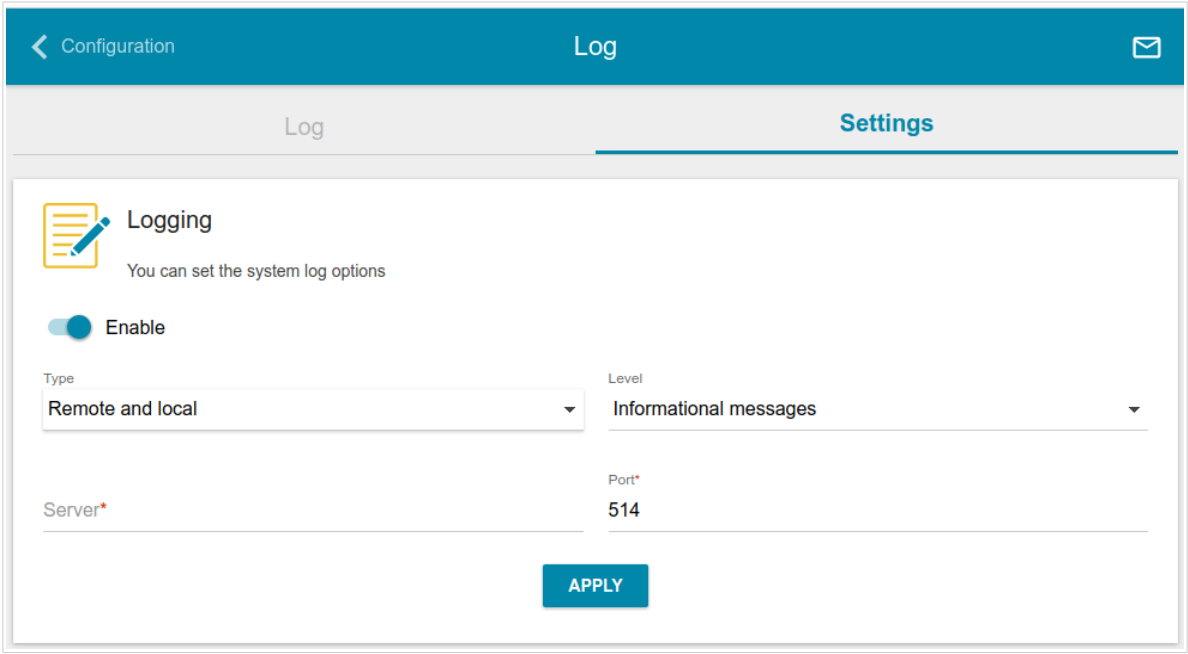


*Figure 60. The **System / Log** page. The **Settings** tab.*

To enable logging of the system events, go to the **Settings** tab and move the **Enable** switch to the right. Then specify the needed parameters.

Parameter	Description
Type	Select a type of logging from the drop-down list. • **Local**: the system log is stored in the extender's memory. When this value is selected, the **Server** and **Port** fields are not displayed. • **Remote**: the system log is sent to the remote host specified in the **Server** field. • **Local and remote**: the system log is stored in the extender's memory and sent to the remote host specified in the **Server** field.
Level	Select a type of messages and alerts/notifications to be logged.
Server	The IP or URL address of the host from the local or global network, to which the system log will be sent.
Port	A port of the host specified in the **Server** field. By default, the value `514` is specified.

After specifying the needed parameters, click the **APPLY** button.

To disable logging of the system events, move the **Enable** switch to the left and click the **APPLY** button.

To view the system log, go to the **Log** tab.

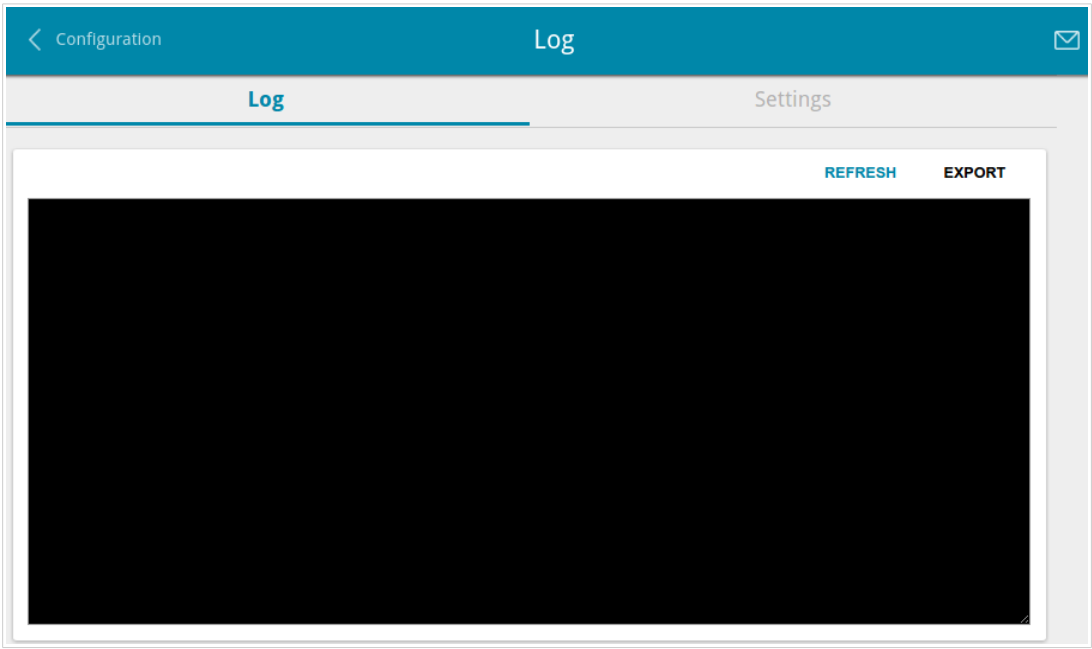


*Figure 61. The **System / Log** page. The **Log** tab.*

To view the latest system events, click the **REFRESH** button.

To save the system log to your PC, click the **EXPORT** button. The file will be stored in the download location of your web browser.

Ping

On the **System / Ping** page, you can check availability of a host from the local or global network via the Ping utility.

The Ping utility sends echo requests to a specified host and receives echo replies.

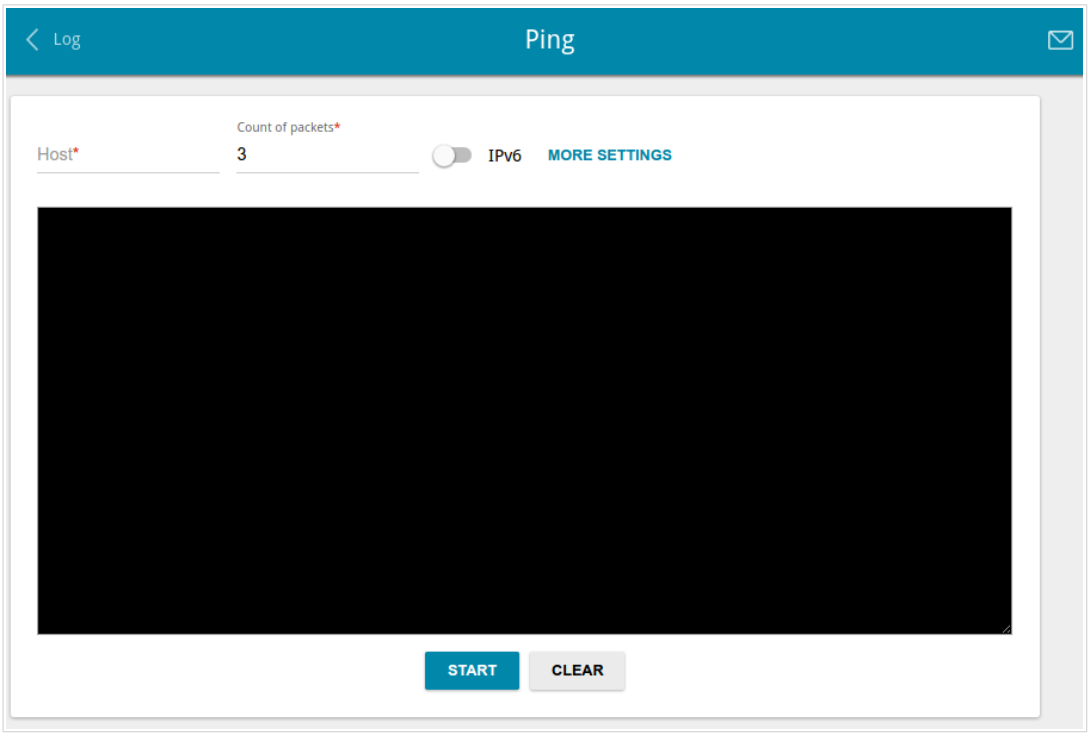


*Figure 62. The **System / Ping** page.*

To check availability of a host, enter the IP address or name of this host in the **Host** field and specify a number of requests that will be sent in order to check its availability in the **Count of packets** field. If availability check should be performed with IPv6, move the **IPv6** switch to the right.

To specify additional settings, click the **MORE SETTINGS** button.

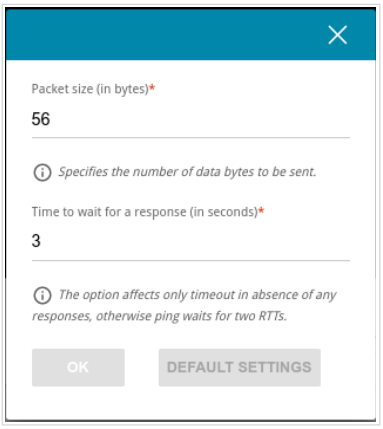


*Figure 63. The **System / Ping** page. The additional settings window.*

In the opened window, in the **Packet size** field, specify the volume of data sent in a request. In the **Time to wait for a response** field, specify the response waiting period in seconds. To restore the default field values, click the **DEFAULT SETTINGS** button.

After specifying the additional parameters, click the **OK** button.

To run the check, click the **START** button. After a while, the results will be displayed on the page. To remove the check result from the page, click the **CLEAR** button.

Traceroute

On the **System / Traceroute** page, you can determine the route of data transfer to a host via the traceroute utility.

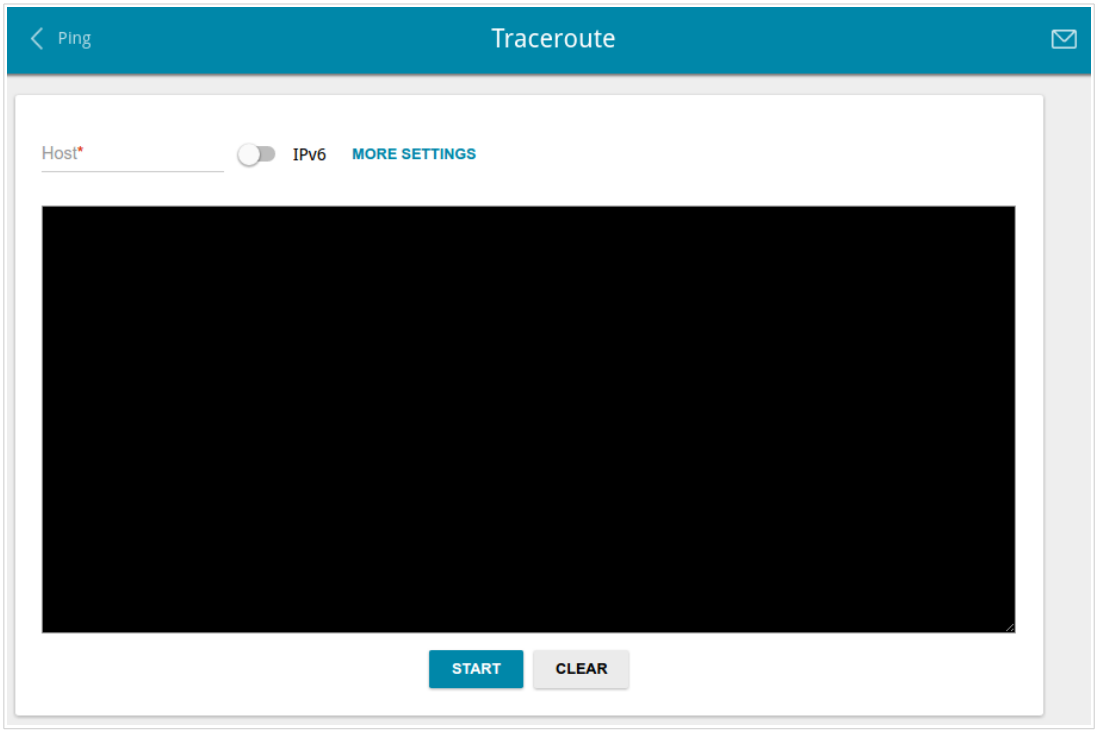


*Figure 64. The **System / Traceroute** page.*

To determine the route, enter the name or IP address of a host in the **Host** field. If the route should be determined using IPv6, move the **IPv6** switch to the right.

To specify additional settings, click the **MORE SETTINGS** button.

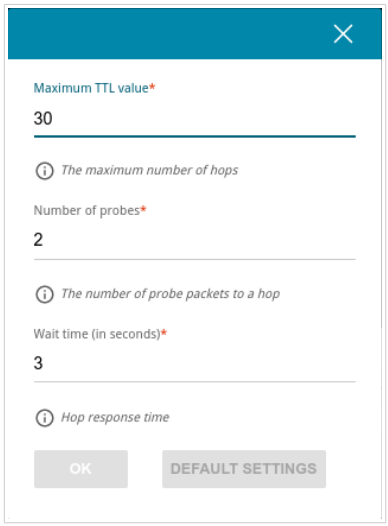


*Figure 65. The **System / Traceroute** page. The additional settings window.*

In the opened window, you can specify the following parameters:

Parameter	Description
Maximum TTL value	Specify the TTL (*Time to live*) parameter value. The default value is `30`.
Number of probes	The number of attempts to hit an intermediate host.
Wait time	A period of waiting for an intermediate host response.

To restore the default field values, click the **DEFAULT SETTINGS** button.

After specifying the additional parameters, click the **OK** button.

To run the check, click the **START** button. After a while, the results will be displayed on the page.

To remove the check result from the page, click the **CLEAR** button.

Telnet

On the **System / Telnet** page, you can enable or disable access to the device settings via TELNET from your LAN. Access via TELNET is disabled by default. It is automatically enabled after changing the default administrator password.

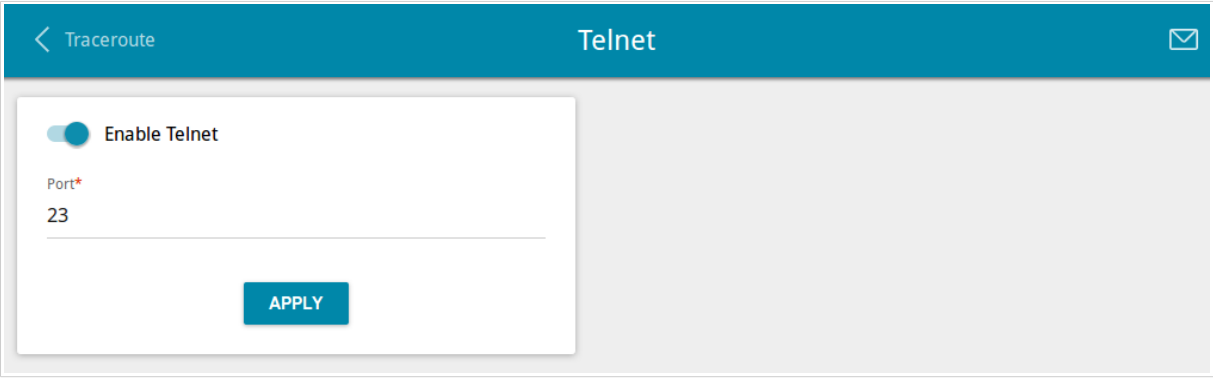


*Figure 66. The **System / Telnet** page.*

To disable access via TELNET, move the **Enable Telnet** switch to the left and click the **APPLY** button.

To enable access via TELNET again, move the **Enable Telnet** switch to the right. In the **Port** field, enter the number of the extender's port through which access will be allowed (by default, the port `23` is specified). Then click the **APPLY** button.

System Time

On the **System / System Time** page, you can manually set the time and date of the extender or configure automatic synchronization of the system time with a time server on the Internet.

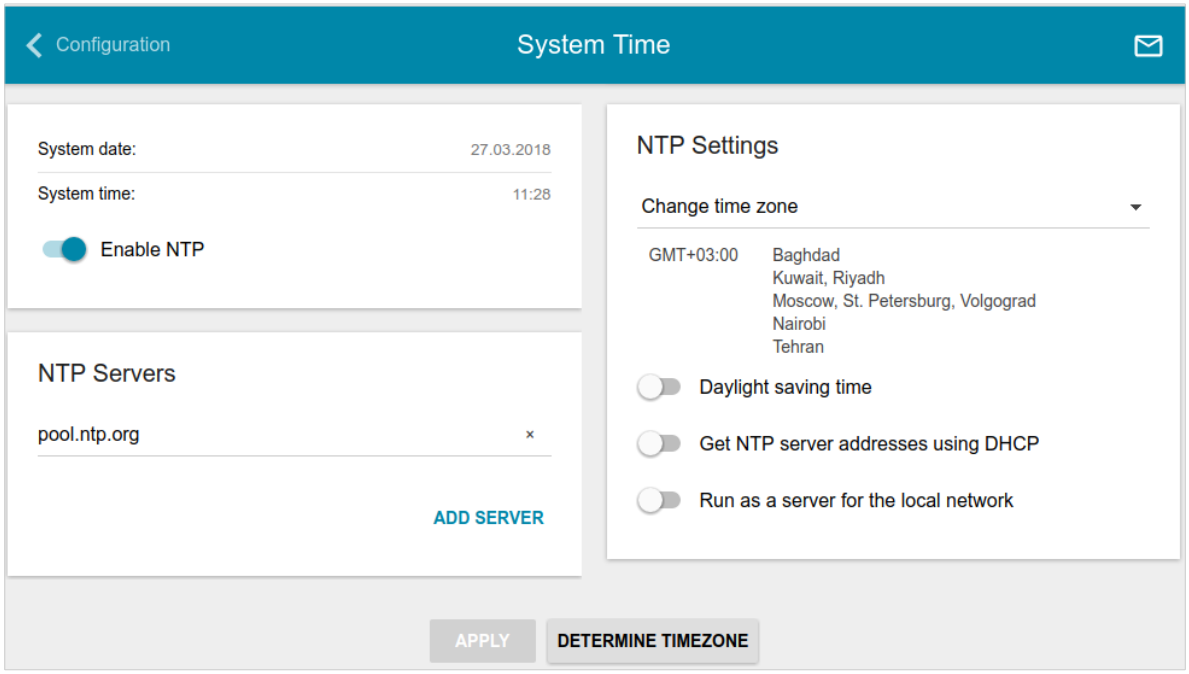


*Figure 67. The **System / System Time** page.*

To set the system time manually, follow the next steps:

1. Move the **Enable NTP** switch to the left.
2. In the **Time Settings** section, specify needed values. To specify the time set up your PC or portable device, click the **SET LOCAL TIME** button.
3. Click the **APPLY** button. The **System date** and **System time** fields will be filled in automatically.

To enable automatic synchronization with a time server, follow the next steps:

1. Move the **Enable NTP** switch to the right.
2. Specify the needed NTP server or leave the value specified by default in the **NTP Servers** section. If you need to specify several servers, click the **ADD SERVER** button.
3. Select your time zone from the **Timezone** drop-down list in the **NTP Settings** section. To set the time zone in accordance with the settings of your operating system or portable device, click the **DETERMINE TIMEZONE** button.
4. Click the **APPLY** button. The **System date** and **System time** fields will be filled in automatically.

To enable automatic adjustment for daylight saving time of the extender, move the **Daylight saving time** switch to the right in the **NTP Servers** section and click the **APPLY** button.

In some cases NTP servers addresses are provided by your ISP. In this case, you need to move the **Get NTP server addresses using DHCP** switch in the **NTP Servers** section to the right and click the **APPLY** button. Contact your ISP to clarify if this setting needs to be enabled. If the **Get NTP server addresses using DHCP** switch is moved to the right, the **NTP Servers** section is not displayed.

To allow connected devices to use the IP address of the extender in the local subnet as a time server, move the **Run as a server for the local network** switch to the right and click the **APPLY** button.

! When the extender is powered off or rebooted, the system time is reset to the default value. If you have set automatic synchronization for the system time, the internal clock of the device will be configured after connecting to the Internet. If you have set the system time manually, you need to set the time and date again (see above).

CHAPTER 5. OPERATION GUIDELINES

Safety Rules and Conditions

Please carefully read this section before installation and connection of the device. Make sure that the device is not damaged. The device should be used only as intended in accordance with the documents.

The device is intended for use in dry, clean, dust-free, and well ventilated areas with normal humidity away from strong heat sources. Do not use the device outdoors or in the areas with high humidity. Do not place foreign objects on the device. Do not obstruct the ventilation openings of the device. The environmental temperature near the device and the temperature inside the device's cover should be within the range from 0 °C to +40 °C.

Plug the device only into working electrical outlets with parameters indicated on the device.

Do not open the cover of the device! Unplug the device before dusting and cleaning. Use a damp cloth to clean the device. Do not use liquid/aerosol cleaners or magnetic/static cleaning devices. Prevent moisture getting into the device.

The service life of the device is 2 years.

Wireless Installation Considerations

The DAP-1610 device lets you access your network using a wireless connection from virtually anywhere within the operating range of your wireless network. Keep in mind, however, that the number, thickness and location of walls, ceilings, or other objects that the wireless signals must pass through, may limit the range. Typical ranges vary depending on the types of materials and background RF noise in your home or office. To maximize your wireless range, follow the guidelines below.

1. Keep the number of walls and ceilings between the DAP-1610 device and other network devices to a minimum – each wall or ceiling can reduce your wireless network range by 3-90 feet (1-30 meters).
2. Be aware of the direct line between network devices. Place your devices so that the signal travels straight through a wall or ceiling (instead of at an angle) for better reception.
3. Building materials make a difference. A solid metal door or aluminum studs may have a negative effect on your wireless range. Try to position your extender and wireless network devices so that the signal passes through drywalls or open doorways. Materials and objects such as glass, steel, metal, walls with insulation, water (fish tanks), mirrors, file cabinets, brick, and concrete will degrade your wireless signal.
4. Keep your extender away (at least 3-6 feet or 1-2 meters) from electrical devices or appliances that generate RF noise.
5. If you are using 2.4 GHz cordless phones or X-10 equipment (wireless devices such as ceiling fans, lights, and home security systems), your wireless connection may degrade dramatically or drop completely. Make sure your 2.4 GHz phone base is as far away from your wireless devices as possible. Note, that the base transmits a signal even if the phone in not in use.

CHAPTER 6. ABBREVIATIONS AND ACRONYMS

AC	Access Category
AES	Advanced Encryption Standard
ARP	Address Resolution Protocol
BSSID	Basic Service Set Identifier
CRC	Cyclic Redundancy Check
DDNS	Dynamic Domain Name System
DDoS	Distributed Denial of Service
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DTIM	Delivery Traffic Indication Message
GMT	Greenwich Mean Time
IGD	Internet Gateway Device
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPsec	Internet Protocol Security
ISP	Internet Service Provider
L2TP	Layer 2 Tunneling Protocol
LAN	Local Area Network
LCP	Link Control Protocol
MAC	Media Access Control
MTU	Maximum Transmission Unit
NAT	Network Address Translation
NTP	Network Time Protocol
OFDM	Orthogonal Frequency Division Multiplexing
PBC	Push Button Configuration
PIN	Personal Identification Number
PPPoE	Point-to-point protocol over Ethernet

PPTP	Point-to-point tunneling protocol
PSK	Pre-shared key
QoS	Quality of Service
RADIUS	Remote Authentication in Dial-In User Service
RIP	Routing Information Protocol
RTS	Request To Send
RTSP	Real Time Streaming Protocol
SIP	Session Initiation Protocol
SSID	Service Set Identifier
TKIP	Temporal Key Integrity Protocol
UDP	User Datagram Protocol
UPnP	Universal Plug and Play
URL	Uniform Resource Locator
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WAN	Wide Area Network
WEP	Wired Equivalent Privacy
Wi-Fi	Wireless Fidelity
WLAN	Wireless Local Area Network
WMM	Wi-Fi Multimedia
WPA	Wi-Fi Protected Access
WPS	Wi-Fi Protected Setup