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Building an HotSpot Wi-Fi network

The making of a HotSpot/Wi-Fi network is a very delicate phase. Factors influencing the design are many: size of the area to cover, the presence of obstacles (walls, vegetation etc.), availability of a wired Ethernet network, number of estimated users etc.

The purpose of this guide is to show some solutions to solve the most common problems that you may face in the implementation of a network Wi-Fi hotspot.

The hardware choice

A network Wi-Fi hotspot is basically composed of two elements:

Hotspot Router: Its task is to manage connections hotspot, ie to enable or disable users to access the Internet. This router is always connected to any device capable of providing internet connectivity such as ADSL/DSL, satellite modem devices and 3G/4G. The choice of the router depends substantially on the number of **simultaneous connections** that the Hotspot must be able to handle. Up to 50 simultaneous connections generally just use the router provided with the basic package of **My Wi-Fi Service** (Tp-Link 841). Above this value should orientate on the **Mikrotik** routers, such as the RB2011 (100 connections), the RB1100AHx4 (500 connections) up to the series routers CCR1036 (over 10,000 connections).

Devices used to extend Wi-Fi signal: such as **Access Point, Switch and Wireless Router**.

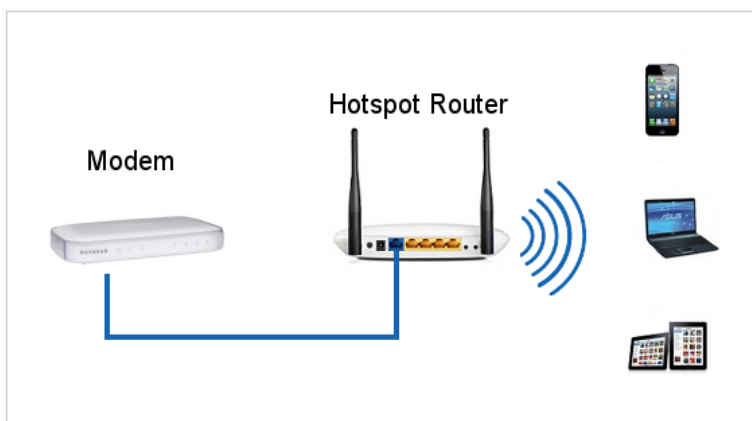
In general you can connect at a hotspot Router any device not using the **Mac Address masking (MAT** or Mac Address Translation). These types of devices, in fact, replace the Mac Address of client connected to them with a unique Mac Address (ie that of the wireless router) preventing Hotspot Router to distinguish the various clients that connect to the hotspot.

The MAT is often used by the Wireless Router, Repeater and Range Extender, while Switch and Access Point do not use masking and can be used without problems in the network Hotspot.

The wireless router can be used to repeat the signal Wi-Fi only in WDS mode, while it is strongly not recommended the use of Repeater and Range Extender.

Basic Configuration

The minimum configuration necessary to manage a Wi-Fi hotspot consists of a Hotspot Router (wireless) connected to a modem (ADSL, DSL, satellite, etc.).



(/Content/images/WiFi_Network/Base_Config.png)

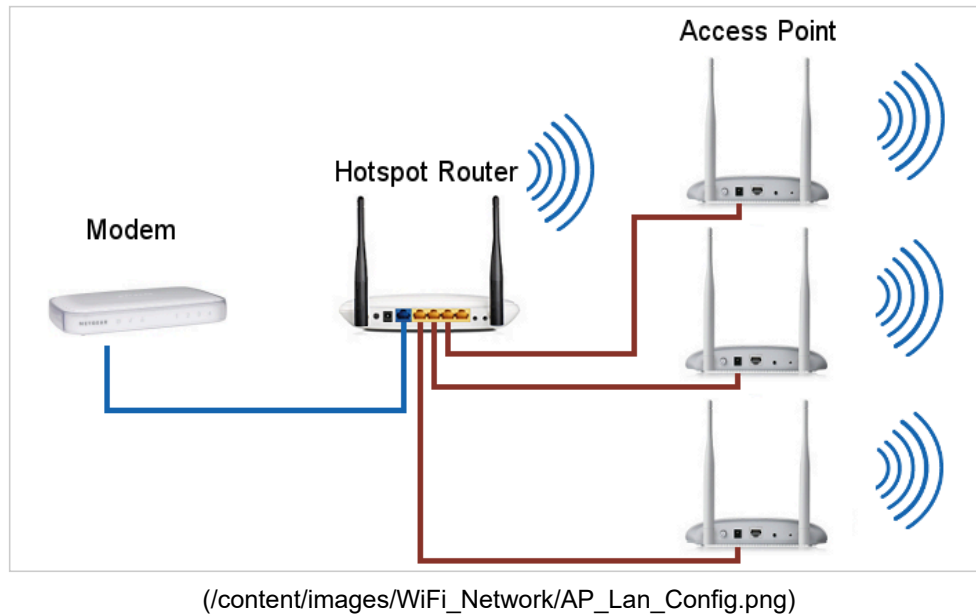
As seen from the diagram above, the installation of a hotspot like this is trivial. But this is a small hotspots which cover a rather limited because the Wi-Fi signal is issued only from the router Hotspot Router.

The size of the covered area are difficult to predict. In open space coverage can have a radius of 20-30 meters, while inside a building will decrease drastically until a radius lower than 10-15 meters. In the latter case the covered area is strongly influenced by the number and dimensions of the walls in the room.

Generally, a network of this type is enough only for Wi-Fi hotspot in Bars, pubs, restaurants and libraries.

Using Access Point

The most efficient way to extend the coverage of Wi-Fi signal is to connect the access point hotspot router via ethernet cables. To use this configuration it is essential that disabled the option "Separate from the WiFi Lan" in the location of **My Wi-Fi Service**.



The Access Point can also be connected to the switch in turn connected to the Hotspot Router. In this way you can cover an area of arbitrary size using all Access Point required. This configuration is well suited to cover large indoor environments, such as hotels, or the outdoor areas such as campgrounds and resorts.

In the latter case you will need to use outdoor access point such as Ubiquiti Picostation M2 that have the great advantage of supporting PoE (Power over Ethernet cable). In this way, each antenna will be achieved only by ethernet cable.

The configuration of these access points is reduced substantially to setting the SSID and IP address, that must be in the same subnet Hotspot Router.

This subnet is 192.168.182.0/24 for devices based on DD-WRT, OpenWrt and CoovaAP, while Mikrotik routers operate on 10.182.0.0/16. In the first case we are going to use a configuration like this:

- IP address: 192.168.182.2 (3,4,5...)
- Subnet: 255.255.255.0
- Gateway: 192.168.182.1

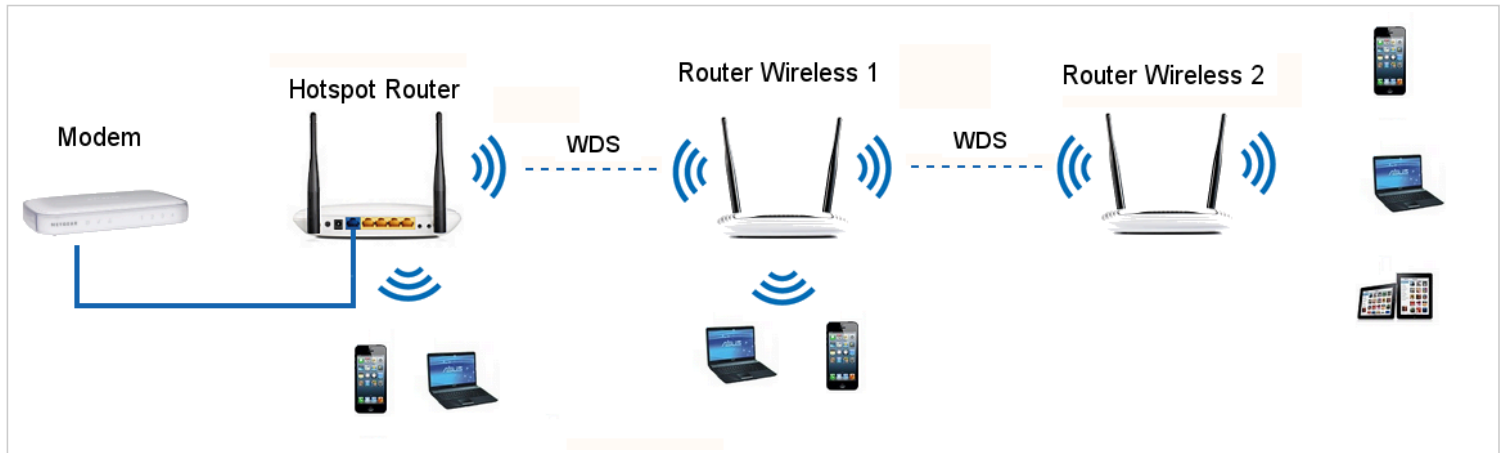
while, for Mikrotik:

- IP address: 10.182.0.2 (3,4,5...)
- Subnet: 255.255.0.0
- Gateway: 10.182.0.1

If you use the antennas "Picostation" will also need to disable the technology Airmax.

Using WDS

There are cases where you can not connect the Access Points to the Router HotSpot via ethernet cables. Consider, for example, Hotels that do not have a cabling ethernet, or camping where the placing of cables is particularly complex and expensive. In these situations we can build our network using the wireless technology to repeating the signal, called WDS.



(/content/images/WiFi_Network/WDS_TpLink_Config.png)

In the image above we note that the Wi-Fi network has been expanded with two routers that, using the WDS, are connected to the Hotspot router without cables.

Hotspot users can now connect indifferently either to the Wi-Fi signal of the Hotspot router or to the signals of other wireless routers, or move between the coverage areas of the routers.

The big advantage of this approach is to not require cables, while the disadvantage is the loss of performance (bandwidth) that grows with the number of connected devices in WDS. In general, however, the reduction of bandwidth is not a significant problem because the transmission speed of the Wi-Fi is always much higher than the speed of the Internet connection that you have.

In this kind of configuration plays a crucial role the deployment of the various routers, each of which will have to be configured to connect to the one located closest to it. In open spaces the distance between each device may be also of many tens of meters (hundreds of meters in the case of antennas Ubiquiti), while in closed spaces hardly the distance may exceed 20 meters. Currently **My Wi-Fi Service** supports WDS only for Hotspot Router with OpenWrt firmware. The other routers in the WDS network must be the same model than the Hotspot Router since the WDS operating is only guaranteed by using router models of the same type or at least with the same chipset for wireless signal.

Let's look at the configuration of the devices in a WDS network based on TP-Link wireless router 841.

The Hotspot Router (which generally comes preconfigured with the basic package of **My Wi-Fi Service**) is a Tp-Link 841n with OpenWrt firmware ver. 14 and other routers are still Tp-Link 841n, but with their original firmware.

Hotspot Router configuration

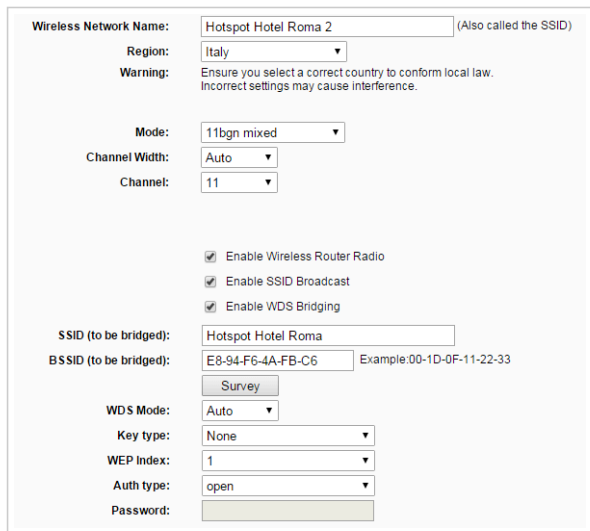
First of all make sure to deactivate the "separate WiFi from LAN" option from the location setting in the MyWiFi Service control panel. Then, the only thing to do on this router is to enable the WDS: in Network | WiFi | Edit | Interface Configuration we will have to ensure that the mode is set to "Access Point (WDS)".

How to configure others Tp-Link with original firmware

The operations to do are the following:

Perform a reset using the button on the back.

In Wireless Settings, enable "Enable WDS Bridging" and pressing the "Survey", select the network with which you want to establish the WDS link, then set "Channel" to the same channel Hotspot Router. Finally, set the region and the SSID of this router (for example "Hotspot Hotel Roma 2 (3,4,5 ...)")



(/content/images/WiFi_Network/TPLinkWirelessSettings.png)

In Wireless Security selezionare "Disable Security"

In DHCP settings, disable the DHCP server (still don't reboot the router)

In Network | LAN set the LAN IP della LAN on 192.168.182.2 (3,4,5..)

The configuration of the other routers is quite similar. The only differences are in the IP address, nell'SSID chosen and the chance to decide whether to establish a WDS link with the main router or with one of the other routers that are already in WDS mode.

How to make a bridge with two antennas connected in WDS

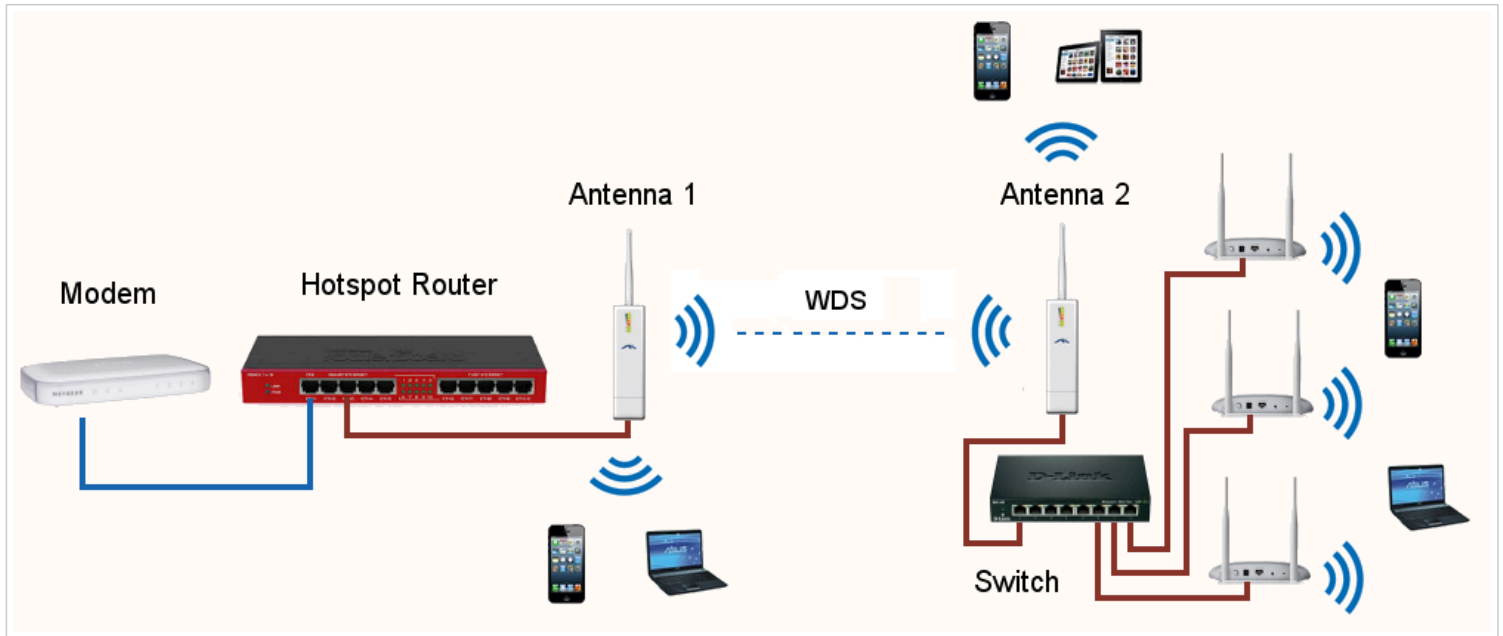
Suppose we need to cover a campground in which there is an isolated area not reached by ethernet cables.

To spread the signal Wi-Fi in this area will use two antennas Picostation, the first connected by cable to a Mikrotik Hotspot Router (suited to handle the high loads of a campground) and the second connected to the first antenna in WDS.

Both antennas also provide a Wi-Fi signal to which users can connect to the campsite.

Moreover, a switch is connected to the second antenna via the LAN port of the PoE and to the switch are connected several additional Access Point (or other antennas).

This configuration is possible because the Wi-Fi and LAN interfaces are bridged to each other and so the Hotspot network is also accessible from the doors Lan antennas.



(/content/images/WiFi_Network/WDS_Mikrotik_Bridge_Picostation_Config.png)

Let's see how to configure both antennas:

Perform a reset using the button on the back.

Open the browser at 192.168.1.20

In the "Wireless" tab, set Wireless Mode on "AP-Repeater", in WDS Peers put the Mac address of the other antenna, specify an SSID and a frequency (channel) transmission common to the two antennas, and finally set the "Channel Width" of 20 MHz.

(/content/images/WiFi_Network/Picostation_AP-RepeaterMode.png)

In the first Tab disable the airMAX technology

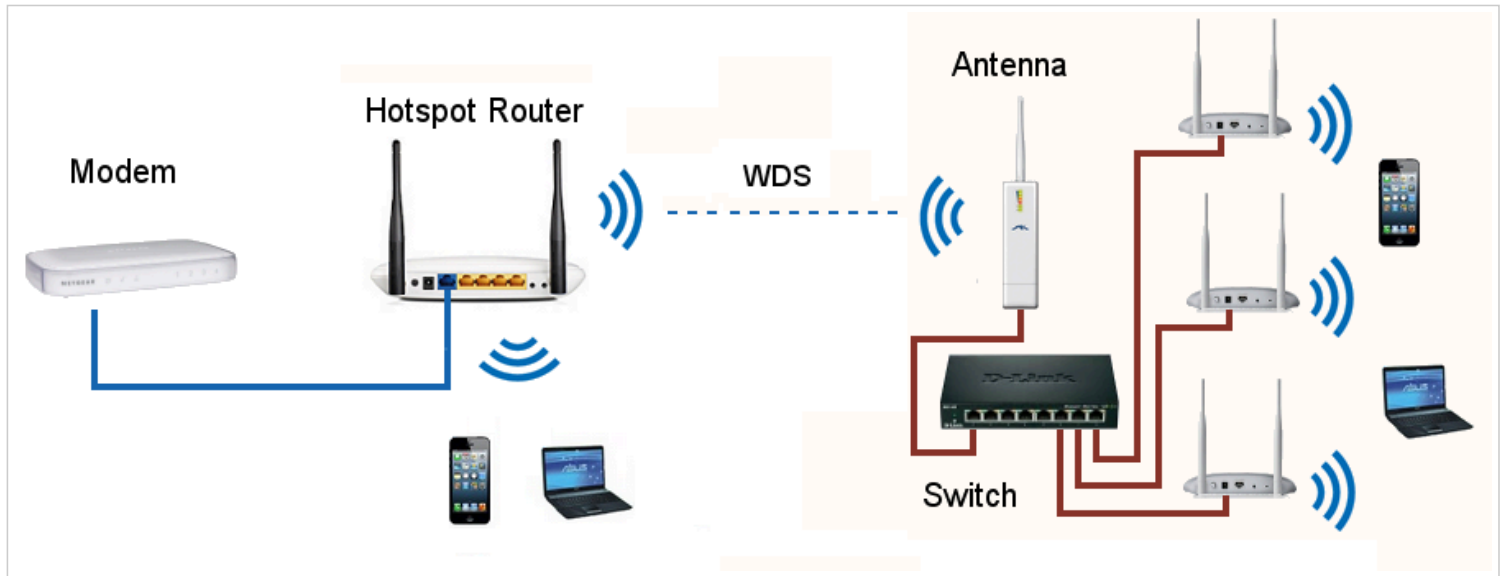
In Network | Management Network Settings, set the LAN Ip on 10.182.0.2 (10.182.0.3 for the other), subnet 255.255.0.0 and gateway 10.182.0.1

To confirm the changes made in each Tab is always necessary to click on "Change" and then "Apply". Note that, unlike the WDS between TP-Link devices, in this case you can not set a different SSID for each antenna.

WDS connection of an antenna to a Hotspot Router Tp-Link

In this example we see how to make a connection between the WDS Hotspot Router (TP-Link 841 with a firmware OpenWrt) and an antenna Picostation.

This type of connection is possible because, although they are different devices, both use the same chipset for wireless (Atheros). Consider that in this case, users can not connect directly to the antenna but must do so through the access points connected to the antenna.



(/content/images/WiFi_Network/WDS_TpLink_Picostation_Config.png)

To configure the Hotspot Router applies the same considerations of the WDS configuration between TP-Link, while for the antenna will need the following steps:

Perform a reset using the button on the back.

Open the browser at 192.168.1.20

In the "Wireless" Tab, set Wireless Mode on "Station", enable the WDS (Transparent Bridge Mode), click on "Select..." button, choose the network to connect in WDS and click on "Lock to AP". Then set "Channel Width" on 20 Mhz

The screenshot shows a configuration window for the 'Wireless' tab. The 'Wireless Mode' is set to 'Station'. The 'WDS (Transparent Bridge Mode)' is checked and labeled 'Enable'. The 'SSID' is 'Hotspot Hotel Roma' with a 'Select...' button. The 'Lock to AP MAC' is 'E8:94:F6:4A:FB:C6'. The 'Country Code' is 'Italy'. The 'IEEE 802.11 Mode' is 'B/G/N mixed'. The 'Channel Width' is '20 MHz'. The 'Channel Shifting' is 'Disable'. The 'Frequency Scan List, MHz' is unchecked. The 'Auto Adjust to EIRP Limit' is checked and labeled 'Enable'. The 'Antenna Gain' is '0 dBi'. The 'Cable Loss' is '0 dB'. The 'Output Power' is '20 dBm'. The 'Data Rate Module' is 'Default'. The 'Max TX Rate, Mbps' is 'MCS 7 - 65 [150]' with an 'Automatic' checkbox checked.

(/content/images/WiFi_Network/Picostation_StationMode.png)

In Network | Management Network Settings, set the LAN Ip on 192.168.182.2, subnet 255.255.255.0 and gateway 192.168.182.1

Networks with multiple SSID

In case of simultaneous use of an Hotspot and one or more Info Portal Wi-Fi (</en/Software/InfoPortal>) we are in presence of a network with at least two **SSID**.

In this case, the above schemes are not applicable to repeat all the SSIDs. It's necessary to recur to the VLANs use as shown in the tutorial Building Info Portal newtork (/en/installation/Building_InfoPortal_WiFi_Network).

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[Mikrotik Router \(/en/installation/Mikrotik_configuration\)](/en/installation/Mikrotik_configuration)

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[DD-WRT Firmware \(/en/installation/dd_wrt_introduction\)](/en/installation/dd_wrt_introduction)

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[Ubiquiti \(/en/installation/Ubiquiti\)](/en/installation/Ubiquiti)

[Hotspot configuration with a 3G/4G/LTE connection \(/en/installation/Hotspot_Router_3G\)](/en/installation/Hotspot_Router_3G)

[Router configuration Utility \(/en/installation/Router_Configurator_Utility\)](/en/installation/Router_Configurator_Utility)

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