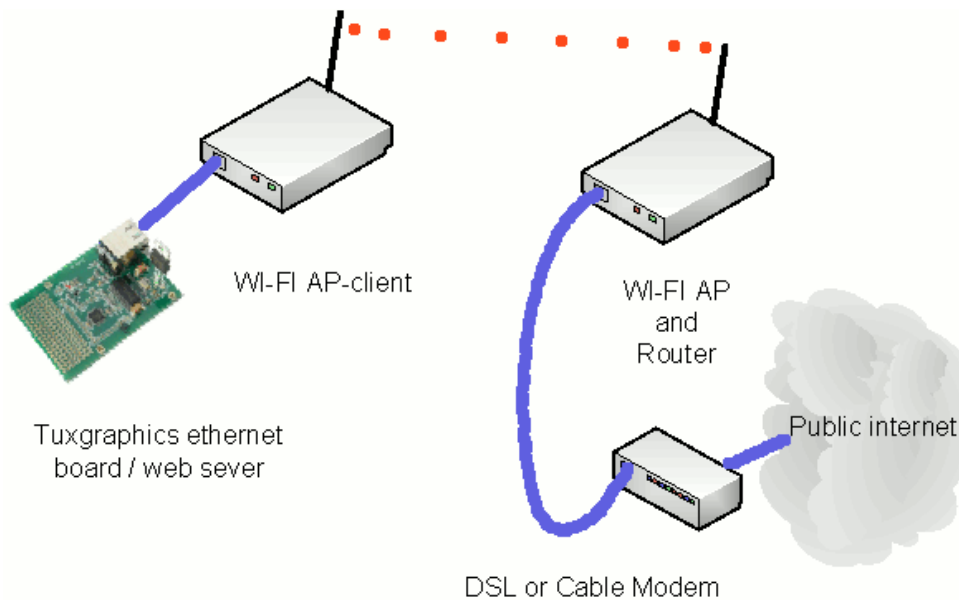




## AVR WiFi



### *Abstract:*

The tuxgraphics ethernet board can be very useful all over the house to take measurements or control devices. Ethernet network cables are however sometimes difficult to add. The solution is wireless: WiFi also known as 102.11a, 102.11g, 102.11n.

How to get tuxgraphics ethernet board in the graden pavilion or cabana connected to the home network using WiFi?

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# WiFi

It would be possible to connect an AVR microcontroller to a WiFi card. The challenge is however the encryption. There are not only a number of different encryption algorithms but it is as well a challenge to implement all of them in a microcontroller.

# Off the shelf WiFi AP-clients

There is a lot of completion in the market for WiFi electronics and all of those devices are mass produced. I bought recently a new Longshine WA-45 WIFI AP-client for 35 dollar. The price is to low that it becomes impossible to compete with that. The best solution is therefore to use such an off the shelf WiFi AP-client.

You can find a variety of those WiFi AP-clients in any specialized supermarket for computer and electronics. They are usually sold as "WiFi Bridge and Access Point". On the box it will normally say **"WIFI Access Point" or "WIFI Bridge" but NOT "WIFI Router"**. On the back of the box you might see some explanation saying that you need in addition a router to connect to the internet and that this system can be used to connect existing ethernet devices to a wireless network.

# How to use a WiFi AP-client

Those "WiFi Access Points" can normally be configured to work in a couple of different modes:

- **WiFi AP (Access Point)**
- **WDS (Wireless Distribution System) Bridge** with AP or without AP function. This is used to enable wireless interconnection of multiple APs. This works usually only if you have two or more WDS bridges of the same type.
- **AP-Client.** An AP-Client will transform any IEEE 802.3 device (wired network device) into an 802.11b/g/n wireless client. This mode is also known as Gaming Console WiFi Adapter or Wireless-Client mode.

We are after the "AP-Client" mode.

Those "WiFi Access Points" are small boxes with a single ethernet rj45 jack and an antenna. You configure them to connect to a given WiFi network identified by its name (SSID).

Here is how they look like. Most of them work very well.



Longshine WA-45, works very well.



Level 1 wap0006, works very well.

A product to avoid is the D-LINK DWL-2100A. It can not be used to connect a server to a WiFi network as it does not handle initial Ethernet ARP broadcasts correctly.

# Wireless Client Configuration

The setup is from a hardware point of view very simple. You just connect the AVR ethernet board to AP-client adapter with a short cable.

The configuration might be a bit more complicated. In most cases you will have to connect in your computer with an ethernet cable and then access a configuration web page at a factory pre-set IP address.

The details depend on the manufacturer but I can give a few tips. You want the WiFi AP-client to be as "dumb" as possible. It should be a "wireless cable" to the AVR ethernet board.

The AP-client configuration should normally require only the following parameters. If the menu system asks for more parameters then you are probably in the wrong mode.

1. Mode: AP-client.
2. Band: 802.11 A/G/N, select the band that is compatible with your already existing WIFI network.
3. ESSID of the AP to connect to. The "name" of your already existing WIFI network.
4. WLAN MAC: Some AP-clients might requires this and others not. The idea is that there could be bigger WIFI networks with multiple APs and you want to select one of the APs by its MAC address. If this option is needed then go to your already existing WIFI router and check what the MAC address on the WIFI side is.
5. A page with security and encryption related settings.
6. A page with LAN IP setup. Here you configure the IP address under which the AP-client can be reached for configuration purposes. This page has nothing to do with the IP address of the ethernet board you want to attach. A good AP-client has a field called "**clone MAC**" where you can specify the MAC address under which the board shall be visible in the WiFi LAN. Set it to the MAC address of the board that you plan to attach.

Once you think that the configuration is complete I suggest to take a PC, shut down the PCs WIFI interface and connect it to the WIFI AP-client adapter. Check if it gets a new IP address from the DHCP server insider you WiFi Router (not the AP-client) and check on the PC what that address is. Then go to a different PC in the network and ping that address. Connect the tuxgraphics ethernet board once this this test was successful.

# Reliability of WiFi

We all love WiFi because it can provide network access at a decent speed all over the house. There are however temporary reliability issues related to interference with other devices such as the neighbors WiFi system or cordless phones and some toys for children. Cordless phone are particularly problematic because you can not see them when scanning for other interfering WiFi networks. There is as well a problem with penetration through iron enforced concrete walls or aluminum foil vapor barriers used in wooden houses.

Nothing beats the reliability of a wired ethernet cable but we all use WiFi because it has an aspect of convenience.

# References/Download

- The tuxgraphics avr ethernet board is available in our online shop: [shop.tuxgraphics.org](http://shop.tuxgraphics.org)  
The tuxgraphics ethernet board provides a web server with the possibility to control hardware and read sensors. It is not a web server for downloading files but one for controlling hardware.