Intel Do-It-Yourself Challenge
WiFi

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WiFi

Network

There's an Ethernet port on the board,
that's a 29euro optional shield you won't have to buy.

But there's also a mini PCIe slot !
You can plug a small laptop-style WiFi card.

That's cheap (7.5 euros for a Intel 135BN) compared to an official WiFi shield (69 euros + VAT). And a lot smaller too.

Galileo has the good sides of Arduino … and PCs !

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We'll use …

Hardware

Galileo board, Intel WiFi card, antenna.
You can get an Intel 135BN online for 7.5e,
or borrow one from a laptop (most laptops use this format).

Software

By default, the small linux image provided only contains the drivers for N-135 and N-6205.
But it's easy to add drivers for other intel supported cards.

Setup

The board is booted from a SD card,
and we are connected over Ethernet with ssh.

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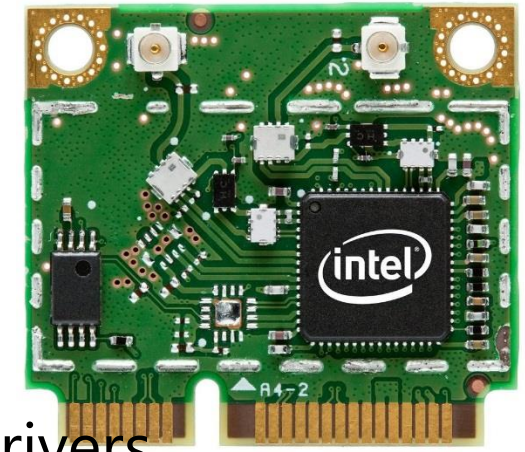
Get the drivers



Do I need additionnal drivers ?

If you took the small linux image, there's 2 drivers.
If you took the large linux image, there's a lot more.
In any case, all the supported drivers are on kernel.org

Download drivers

From kernel.org :
http://wireless.kernel.org/en/users/Drivers/iwlwifi

Unpack and copy to SD card

Unpack with "tar –xvzf iwlwifi-XXX.tgz",
copy files from your PC to the SD card.

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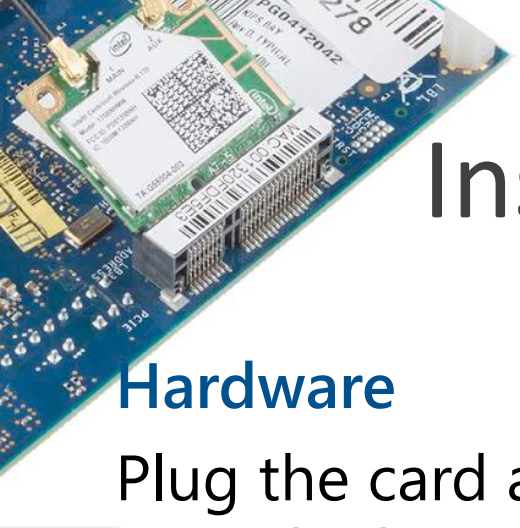

Install card and drivers

Hardware

Plug the card and connect the antenna.
Boot the board and ssh.

Copy files

After you copied the files from your PC to the SD card,
or downloaded the file directly on the galileo, copy them :
“cp /where-I-copied-the-files/*ucode /lib/firmware”

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WPA protection

WPA

Get you SSID and WPA password,
then type (replacing the SSID with the right value) :
“wpa_passphrase SSID << EOF > /etc/wpa_supplicant.conf”

press enter,

type your password,

press enter,

type “EOF”,

press enter.

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Automatic Wireless

Edit network interfaces config file

Edit with your favorite command line editor the file “/etc/network/interfaces”.
We’ll use vi : “vi /etc/network/interfaces”
Press “i” to enter in edition mode.
Type “auto wlan0”, press enter, press escape.
Type “:wq” to save and exit vi.

Your Wireless card will be enabled by default.

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Automatic WPA

Edit network interfaces config file

Edit with your favorite command line editor the file “/etc/network/interfaces”.
The file should look like :
“auto wlan0

iface wlan0 inet dhcp

wpa-conf /etc/wpa_supplicant.conf”

Edit network interfaces config file

Restart the networking service :

“/etc/init.d/networking restart”

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Preparing and booting the SD card

SD card

Format the micro SD Card

Connect the micro SD card to your PC, format as fat32.

Adapters

To connect the microSD to your PC, you can use :

> a SD-microSD adapter if you have a SD slot in your PC

> a USB-microSD adapter

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Boot

Boot loader

The Galileo board is using grub, a common tool.

How to boot

Plug the SD card in the slot of the Galileo board.

Plug the power supply, wait for the green LED, plug via USB.

What's working ?

You can still send sketches from the Arduino IDE, but you now have a linux running with included services and libraries like SSHd, bluez, nodejs, OpenCV.

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Enable networking

Ethernet

Procedure

We'll need to run a sketch from the Arduino IDE to :

> use the "Ethernet" package to enable the Ethernet port
> launch a ifup linux command with "system" to enable the interface.

Then your board will receive an IP address from your local DHCP server (usually your home router),
or will use the fixed IP you provided if DHCP doesn't work.

Then you'll be able to connect with ssh
and get rid of the IDE.

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Ethernet

Procedure

> Plug the Ethernet cable
> Copy/Paste the sketch on next slide to your IDE window
> Edit the MAC (sticker on your board) and IP values
> Validate and upload.
> Determine your IP address.
> ssh to you Galileo IP as root.

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Sketch to copy/paste

```
#include <SPI.h>
#include <Ethernet.h>
// MAC address for the Galileo (there's a sticker on the Ethernet connector)
byte mac[] = { 0x??, 0x??, 0x??, 0x??, 0x??, 0x?? };
//the IP address for the Galileo: (will be used if there's no DHCP server on your network)
byte ip[] = { ???, ???, ???, ??? };

void setup() {
delay(5000); //let the time time to open the serial monitor
Serial.println("Attempting to configure Ethernet using DHCP");
if (Ethernet.begin(mac) == 0) {
        Serial.begin(9600);
        Serial.println("Failed to configure Ethernet using DHCP");
        Serial.println("Attempting to configure Ethernet using Static IP");
        Ethernet.begin(mac, ip);
        Serial.println(" Please check ifconfig");
        }
system("ifup eth0"); // load Ethernet interface!
else Serial.println("Sounds good");
} }
void loop () {}
```

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What’s my IP ?

What's my IP address ?

Fixed IP

If you have no DHCP router and entered an IP, you have it.

Router info page

If you have a home router, you can consult the DHCP log.

Display ifconfig output

Run sketch from the following slide, it will :
> run the ifconfig linux command
> output the result in a file
> display the file content

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Sketch to copy/paste

```
char output[500];
void setup(){
        Serial.begin(9600);
}

void loop(){
        system("ifconfig > log.txt");
        FILE *fp;
        fp = fopen("log.txt","r");
        while(fgets(output,500,fp) != NULL)
                Serial.println(output);
        fclose(fp);
        delay(5000);
}
```

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ssh

ssh

Serial log

After running the sketch, your board should be connected to your LAN network.

ssh

ssh root@192.168.1.100 # replace with your IP
You should see :
root@clanton:~#

Reboot ?

If you reboot your card, you should be able to reconnect automatically. Wait at least 45 seconds for the OS to load the network and ssh service.

Tips and links

If you have WiFi problems …

Card and antenna

If you have WiFi problems, check your card and antenna.

SSID list

Launch the command : “iwlist wlan0 scan” to list networks.

Reload the WiFi interface

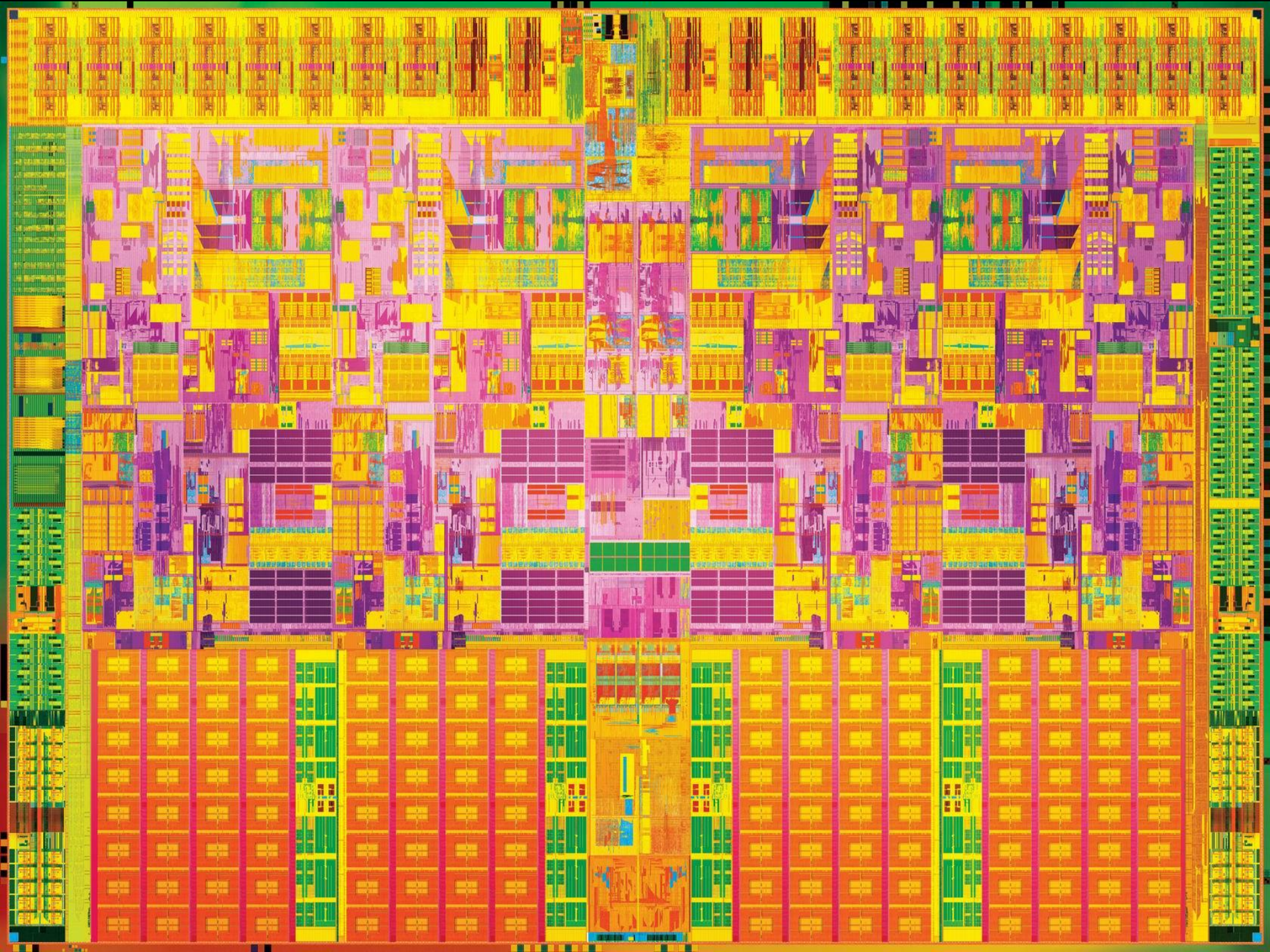
Launch the command : “ifup wlan0”

Links

http://wireless.kernel.org/en/users/Drivers/iwlwifi

http://www.malinov.com/Home/sergey-s-blog/intelgalileo-addingwifi

http://help.ubuntu.com/community/WifiDocs/WiFiHowTo



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