OpenLEDRace Network Bundle - AD2020

*This document describe how to Install and Setup the two software components of the **Open LED Race Network Bundle** (Network Client and Arduino Firmware).*

First time users:

Please read the document from the beginning to have a quick overview of what we are talking about.

You already know Open Relay Race:

See "**Install Software Components**" for install/update instruction

See "**Run OLRNetwork Client**" to learn how to play a Relay Race with others

Impatient

- Website : (http://www.openrelayrace.org/)

- If you haven't done it yet, **Sign up** and **Download the Software Bundle** from Website

- Move the zip file in a newly created folder (base folder) and extract it.

- In Website → Home click [**Request Id**] button (Section [2] – Register your device)

  - Fill form (device description) and click [**Add Device**] button.

  - Copy somewhere the generated **"Board Id"** and click [**Download cfg file**]

  - Save the "**config.json**" file and move it in "**base folder/NetworkClient/data**"

- Arduino

  - **Flash** the Arduino software you'll find in "**base folder/Arduino/open_led_race/**" **into your board** (Board: **Arduino Nano**, Processor: **ATmega328P (old bootloader)**)

    - **<u>Only if you are installing the Arduino software for the first time to this board:</u>**

      - **write** the **"Board Id"** generated online:

        - Send the command ":*your_boardId*" *(without quotes).*
          *Example: if **"Board Id"** was "TDOabcdefghilmno", send the command:*
          :TDOabcdefghilmno
          The Arduino **should** answer ":OK".
        - Check: Send the "**$**" command *(again, without quotes)*
          the Arduino answer with it's **"Board Id"**
          example: **$TDOabcdefghilmno**

- Thats it. *Your OpenLED Race Board is ready!*

  *If you run the NetworkClient on the computer, you will see the configured board **in a "Online" status** (after the NetworkClient connects to the MQTT Broker) and, after few seconds, in **"Available" status** (after the NetworkClient ←→ Board **Handshake**)*

What is a Relay Race ?

The "Software Components" enable **two or more** OLR Devices to play a relay race.

You can get an idea of what a Relay Race looks like in the video below:
  http://www.openrelayrace.org/storage/app/media/RelayRace_1.mp4

Notes about the video:

1. You see **two** Racetracks (Open LED Race Device + LED Strip).
    There are **two** Network Clients (computers) managing **one OLR Device each**.
    They exchange MQTT messages via an "external" MQTT broker *(i.e. the Broker is **not** running on a server in the local network)*.
    Messages from one OLR Device travel through the Internet to reach the broker, come back and "reach" the other Device.
    This means:

    1. *The 'delay' you see between the moment when a car 'leave' a circuit and 'enter' the other would be more or less the same if one of the circuit is in a different place (city, state, etc). The delay in the video is around 385 mSec.*

    2. *You can use a **local MQTT broker** and play Relay Races within 'Teams' of users in the same phisical space. In this case you don't need an Internet Connection.*
        *You can see a video of a Relay Race with 3 racetrack and a **Local Mosquitto Broker** following the link below:*
            http://www.openrelayrace.org/storage/app/media/3Tracks_noCountdown.mp4

        *In this case the **delay is around 75 mSec**.*

2. There are no 'Players'.
    The code on the OLR Boards is running in "Simulator mode" (*special mode useful to develop/debug the Network Client).*

    The software is the same one running on the Arduino when actual players are using the device. The only differece in 'Simulator mode' is the software 'click' the Player button by itself (*while in "Normal mode" this is done reading the state of the I/O pin associated with the Player*)

System Overview

- **Network Client Software**
  Runs on a Computer and Manages Relay Races (Create, Join, etc).
    Think at it like a sort of 'messenger' where you see who is online to create a temporary 'group' of devices that will play a Relay Race
  It communicates with Arduino via USB (Serial) and exchanges configuration commands and "race-time" commands (car 'x' is entering this circuit, car 'x' is leaving this circuit, etc)

- **Arduino Firmware**
  A 'modified' version of the original Open LED Race Arduino software.

  You will need to 'flash' it to your arduino.
  Make sure you have a working Arduino IDE or an account on https://create.arduino.cc/ or PlatformIO...or anything else you can use to to flash software on the Arduino Board
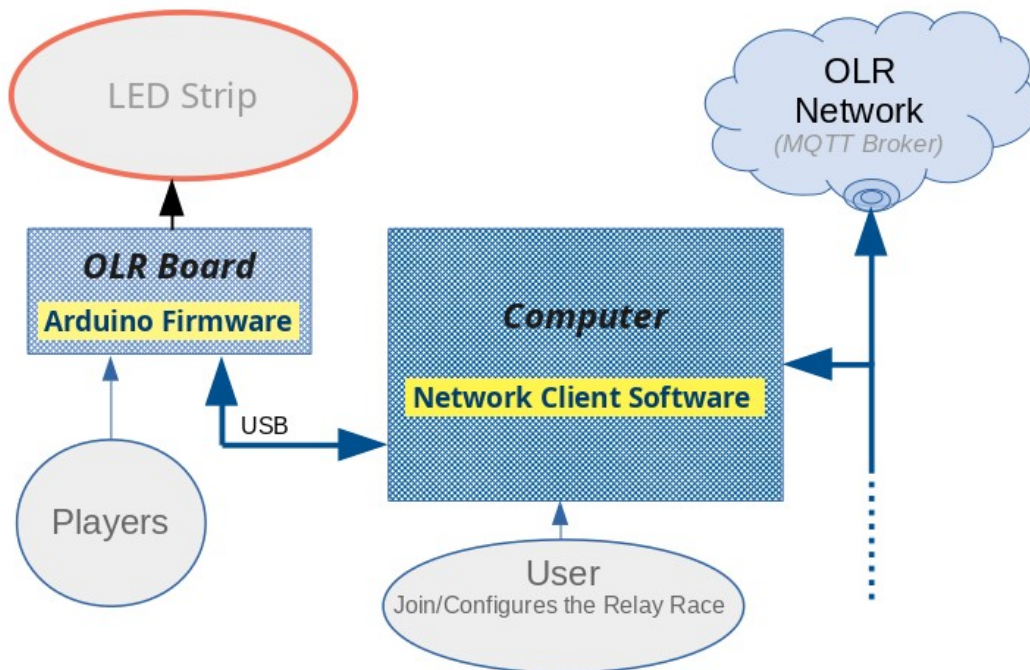
Install Software Components

If you haven't done it yet, **download the Software Bundle** containing the system components (http://www.openrelayrace.org/). *The page requires a registration (we need to manage Unique Ids for each device on the network).*

- Create a **new folder** on your computer, **move there the *zip* file you downloaded**, and **extract it**.

From now on in this document we'll refer to this base installation folder with
   "Desktop/OpenLedRace/".
You can choose any other folder name/position.

Setup OLRNetwork Client

1. Log into the OpenRelayRace project page (where you downloaded the software): http://www.openrelayrace.org/ and go the the home page.

2. Click [**Request Id**] button
   in the "(2) - Register your Open LED Race Devices" section

3. Write a short description of your device
   this is what other users will see when your device gets online
   Something like "OLR Build – wrapped aroun air-cond pipes" will do

4. Click [**Add Device**] button

5. You will be redirected to the page of the "Board" you just created.
   If you like, you can upload an image of your racetrack.
   – please 'copy' the generated "Board id" *(in red on the web page)* **–**
      you need it during the Arduino Setup
      (or you can just get it afterward, using "Network Devices→ My Devices"
      menu on the website)

6. Click [**Download cfg file**] button and save the "**config.json**" file.

7. Move the downloaded "**config.json**" file into:

   "Desktop/OpenLedRace/NetworkClient/data"

Next step: Flash Arduino Software

Flash Arduino Software

Go to folder:

Desktop/OpenLedRace/Arduino/open_led_race

and open, with the Arduino IDE, the "**open_led_race.ino**" (this will automaticalli open an additional "tab" for every source file in the folder).

Arduino IDE

1. Connect the OLR Board (Arduino) to an USB port of your computer

2. Be sure to set:
    - Tools > Port: *check that the port setting is correct*
    - Tools > Board: **Arduino Nano**
    - Tools > Processor: **ATmega328P (old bootloader)**

3. Compile and Upload

4. Open a Serial Monitor (115200 baud) and send an "R0" command (without quotes). The Arduino **should** answer "ROK".

    > **Only if this is the first time you Flash the Arduino Software on this Board:**
    >
    > (!) **write** to Arduino the *"Board id"* generated online (!)
    > - in the Serial Monitor, send the command ":`iBoardId_generated`" *(without quotes)*. *Example: if the generated id was "TDOabcdefghilmno", write on the serial monitor:*   `:TDOabcdefghilmno`
    >
    > The Arduino **should** answer ":OK".
    >
    > **Check**: Send the "**$**" commando *(again, without quotes"). T*he Arduino will send back the BoardId **(example:**   `$TDOabcdefghilmno`)

5. Thats it. *Your OpenLED Race Board is ready!*

Next step: Run OLRNetwork Client

Run OLRNetwork Client

Go to the folder where you extract the Network Client
(*ex:Desktop/OpenLedRace/**NetworkClient***) and run (double-click):

NetworkClient

Log file
Every time the Network Client starts, it writes a log file with warnings, status messages, errors, etc.
*Desktop/OpenLedRace/**NetworkClient/output.log***
Always take a look if something does not works as expected.

In case the application does not starts because you don't have Java installed, you can download it here:https://www.java.com/en/download/

The OLRNetwork Client window will look like this
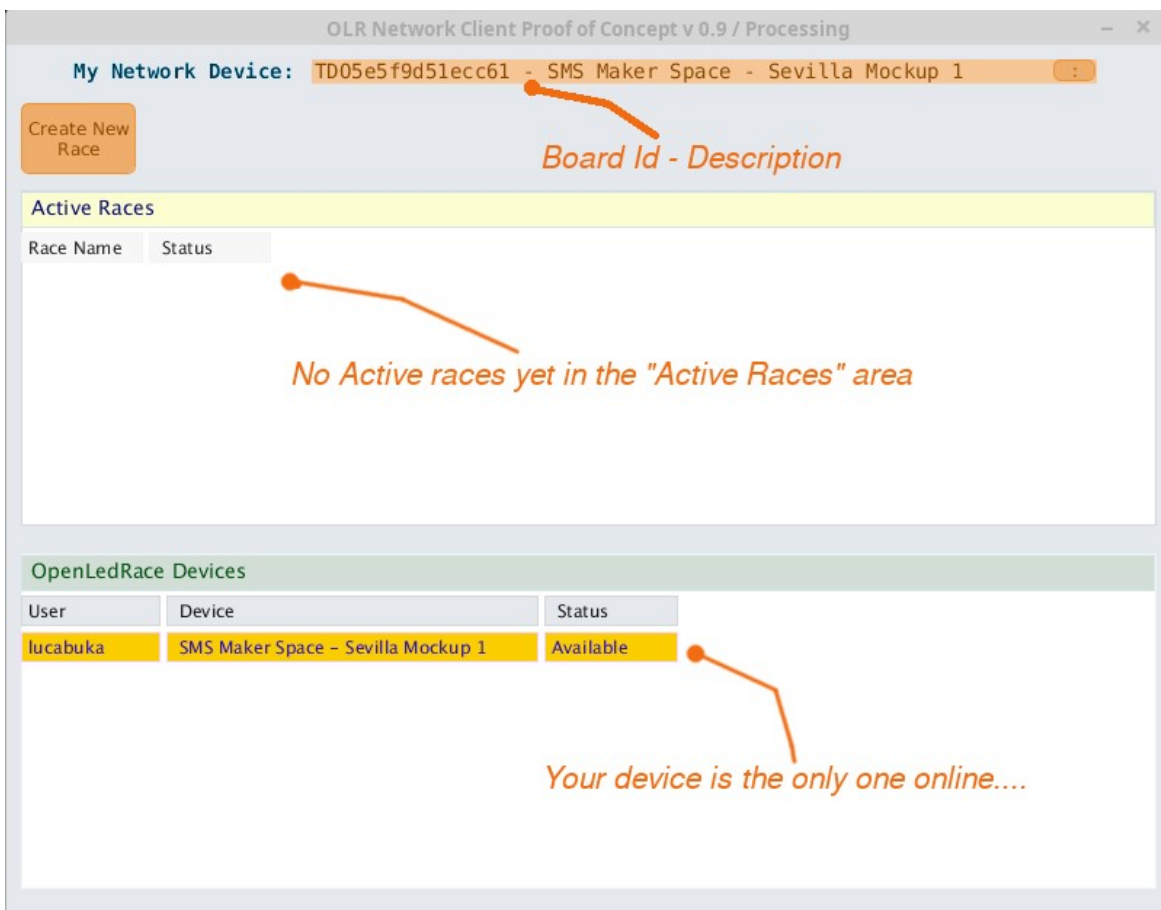
The image was taken when no other OLR Devices was online. This means your UI will probably display other devices and existing race, if somebody else is online.

Your device appeart in "**Available**" status because the Application was able to connect with the OLRBoard/Arduino. *If the program is unable to communicate with Arduino your "status" will be "**Online**" and you'll not be able to create/join races.*

Create / Join a Race

You can create e new race using the button in the top-left part of the interface.

> *Please Note:*
> *The button only appears if the OLRNetwork client is able to communicate with your Arduino!*
> *If the button is not there, please check if the Arduino is connected to an USB port.*

When somebody create a Race, you will see it in the "Active Races" part of the interface and you can JOIN it.
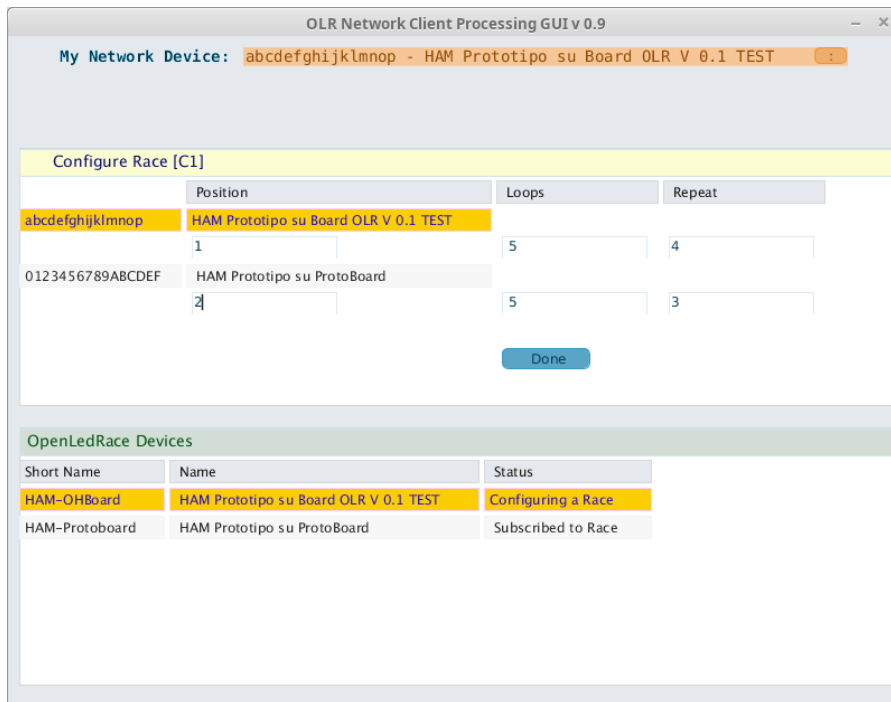
When at least **two** participants join the same race, a "**Configure**" button appears.

The first client who 'click' on "***Configure***" will be the one in charge to set race parameters.

Other participants will see a message about the race being currently configured by another client, and they need to wait until is done.

Next step: Configure a Race

Configure a Race

The race in the image above, have two participants so you see 2 sets of numbers.

Every participant Racetrack have 3 fields to set:

Position:

> **Order** for the Relay Race. The device with lower Position (ex: 1) **will be the one where the race Starts**. The one with the next position (ex:2) will be the one where a Car goes when they complete a set of [n] **Laps** in the first Racetrack.

Laps:

> Number of Laps a car have to complete in this Circuit.
>
> *In the example is [5] for both Circuits, but it can be different*

Repeat: *This is where the user interface gets **very** unfriendly...*

> How many times the Race passes through the circuit.
>
> In the example you see [HAM-OHBoard]=4 and [HAM-Protoboard]=3.
>
> Being the Race starts in [HAM-OHBoard] , the cars will than go to [HAM-Protoboard] than go again to [HAM-OHBoard], an so on.
>
> The race will finish when the **configured "Repeat" for both are done.**

> *For the relay race of this video:*
>
> http://www.openrelayrace.org/storage/app/media/RelayRace_1.mp4
>
> *the configuration is:*
>
> > *Device on the right: Position: 1 Laps: 1   Repeat: 2*
> > *Device on the left: Position: 2 Laps: 1   Repeat: 1*

BE CAREFUL to always set a meaningful value for "Repeat" parameter.

The only valid cases are

> 1. repeat is the same for each circuit
> 2. repeat is **one unit bigger** in the circuit where the race starts (*if you want the race start and ends in the same circuit*).

Race configuration example

There is a video on the website describing the process of "create" → "Configure the race.
Please Note:

The video describe the process **for a very different setup**, **where the same NetworkClient Software manage two OLR Boards**. *This feature is not supported in the "config.json" installed.*

If you have never used the OLRNetwork Client App before, you can take a look at the video to have a raw idea of what we are talking about.

Just think that the "second board" is not connected to your computer but is somewhere else, managed by another user.

http://www.openrelayrace.org/storage/app/media/CreateRace.mp4

Development notes

Please note – This version is __not__ for general public use.

This version of the Network Client was made to test functionalities we want to implement in the first public version.
It's very user-unfriendly...

- *The "Client Configuration" and "Register on the Network" phases are managed in a separate web page (not by the Client itself as it should be).*

- *The first time a OLR Board is "flashed" with the Arduino Software, the Board Unique ID have to be written to the board using the Arduino Serial Console (or other Serial Communication software)*

- *The "Configure Race" interface "expose" low level parameters used to configure the race and let's you type any combination of numbers, **even invalid ones.***
  It's a test-debug interface, not a real user interface.

- *Does not manage gracefully Network and Serial transmission problems.*

Contact

If you want to get in touch, please send an email at:
 info AT openrelayrace DOT org