Yocto-Demo, User's guide

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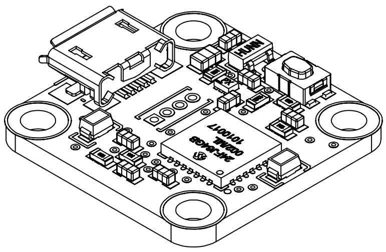
1. Introduction

The Yocto-Demo module is a small 20x20mm module which allows you to command by USB a small green led. In itself, commanding a simple led by USB is not of great interest. The intended goal of this module is to familiarize yourself with the programming APIs of the Yoctopuce modules. Indeed, once you know how to pilot this module, it is very likely that you will know how to pilot the other modules of the range.



The Yocto-Demo module

Yoctopuce thanks you for buying this Yocto-Demo and sincerely hopes that you will be satisfied with it. The Yoctopuce engineers have put a large amount of effort to ensure that your Yocto-Demo is easy to install anywhere and easy to drive from a maximum of programming languages. If you are nevertheless disappointed with this module, do not hesitate to contact Yoctopuce support[1].

By design, all Yoctopuce modules are driven the same way. Therefore, user's guides for all the modules of the range are very similar. If you have already carefully read through the user's guide of another Yoctopuce module, you can jump directly to the description of the module functions.

1.1. Prerequisites

In order to use your Yocto-Demo module, you should have the following items at hand.

A computer

Yoctopuce modules are intended to be driven by a computer (or possibly an embedded microprocessor). You will write the control software yourself, according to your needs, using the information provided in this manual.

[1] support@yoctopuce.com

Yoctopuce provides software libraries to drive its modules for the following operating systems: Windows, Mac OS X, Linux, and Android. Yoctopuce modules do not require installing any specific system driver, as they leverage the standard HID driver[2] provided with every operating system.

Windows versions currently supported are: Windows XP, Windows 2003, Windows Vista, Windows 7 and Windows 8.1. Both 32 bit and 64 bit versions are supported. Yoctopuce is frequently testing its modules on Windows XP and Windows 7.

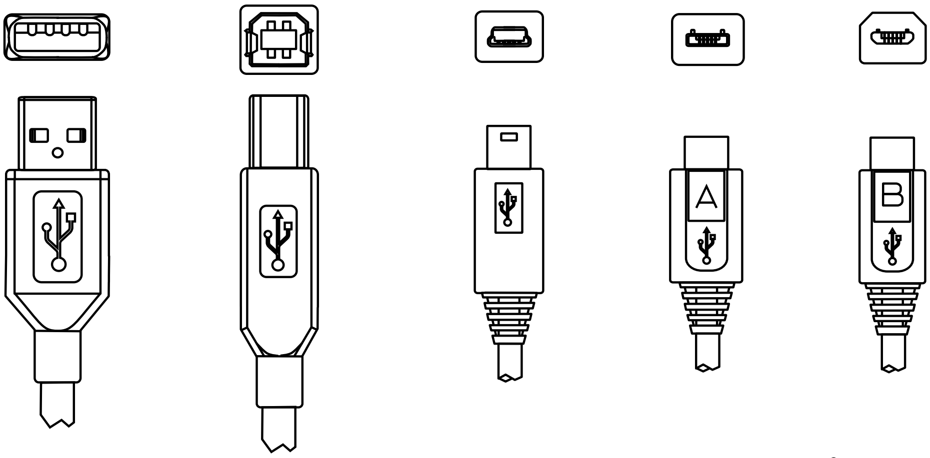
Mac OS X versions currently supported are: 10.6 (Snow Leopard), Mac OS X 10.7 (Lion), 10.8 (Mountain Lion), and 10.9 (Maverick). Yoctopuce is frequently testing its modules on Mac OS X 10.9 and 10.7.

Linux kernels currently supported are the 2.6 branch and the 3.0 branch. Other versions of the Linux kernel, and even other UNIX variants, are very likely to work as well, as Linux support is implemented through the standard **libusb** API. Yoctopuce is frequently testing its modules on Linux kernel 2.6.

Android versions currently supported are: Android 3.1 and later. Moreover, it is necessary for the tablet or phone to support the *Host* USB mode. Yoctopuce is frequently testing its modules on Android 4.x on a Nexus 7 and a Samsung Galaxy S3 with the Java for Android library.

A USB cable, type A-micro B

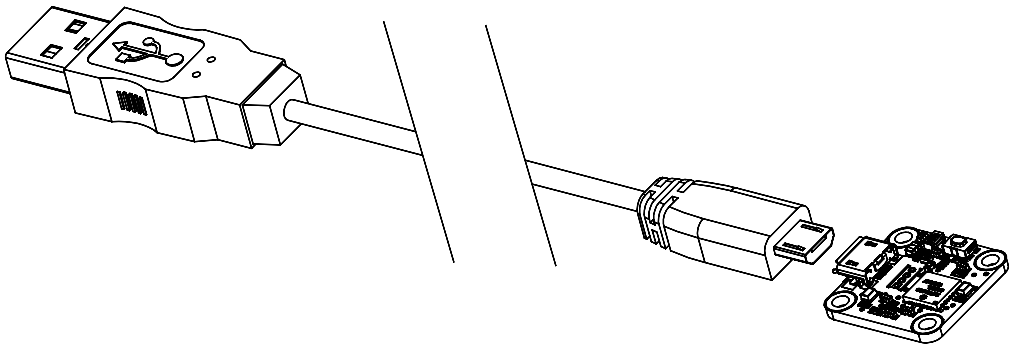
USB connectors exist in three sizes: the "standard" size that you probably use to connect your printer, the very common mini size to connect small devices, and finally the micro size often used to connect mobile phones, as long as they do not exhibit an apple logo. All USB modules manufactured by Yoctopuce use micro size connectors.



The most common USB 2 connectors: A, B, Mini B, Micro A, Micro B.[3]

To connect your Yocto-Demo module to a computer, you need a USB cable of type A-micro B. The price of this cable may vary a lot depending on the source, look for it under the name *USB A to micro B Data cable*. Make sure not to buy a simple USB charging cable without data connectivity. The correct type of cable is available on the Yoctopuce shop.

[2] The HID driver is the one that takes care of the mouse, the keyboard, etc.
[3] *Although they existed for some time, Mini A connectors are not available anymore http://www.usb.org/developers/Deprecation_Announcement_052507.pdf*



You must plug in your Yocto-Demo module with a USB cable of type A - micro B.

If you insert a USB hub between the computer and the Yocto-Demo module, make sure to take into account the USB current limits. If you do not, be prepared to face unstable behaviors and unpredictable failures. You can find more details on this topic in the chapter about assembly and connections.

1.2. Optional accessories

The accessories below are not necessary to use the Yocto-Demo module but might be useful depending on your project. These are mostly common products that you can buy from your favorite hacking store. To save you the tedious job of looking for them, most of them are also available on the Yoctopuce shop.

Screws and spacers

In order to mount the Yocto-Demo module, you can put small screws in the 2.5mm assembly holes, with a screw head no larger than 4.5mm. The best way is to use threaded spacers, which you can then mount wherever you want. You can find more details on this topic in the chapter about assembly and connections.

Micro-USB hub

If you intend to put several Yoctopuce modules in a very small space, you can connect them directly to a micro-USB hub. Yoctopuce builds a USB hub particularly small for this purpose (down to 20mmx36mm), on which you can directly solder a USB cable instead of using a USB plug. For more details, see the micro-USB hub information sheet.

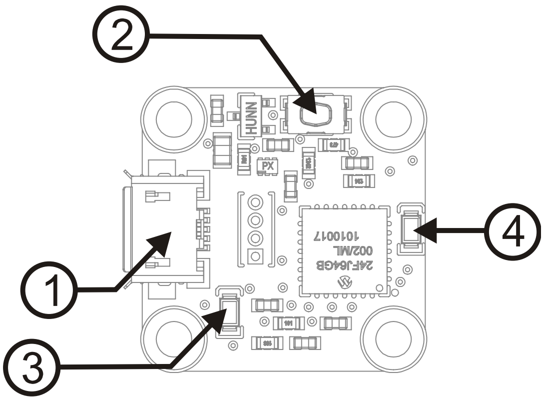
YoctoHub-Ethernet and YoctoHub-Wireless

You can add network connectivity to your Yocto-Demo, thanks to the YoctoHub-Ethernet and the YoctoHub-Wireless. The YoctoHub-Ethernet provides Ethernet connectivity and the YoctoHub-Wireless provides WiFi connectivity. Both can drive up to three devices and behave exactly like a regular computer running a *VirtualHub*.

Solid copper ribbon cable

If you wish to solder the Yocto-Demo module directly to a micro-USB hub to save on the space used by USB cables, consider using solid copper ribbon cable: it is much easier to solder. In any case, you will need cable with 4 wires with 1.27mm pitch.

2. Presentation



1: USB plug 3: Yocto-led
2: Yocto-button 4: test led

2.1. Common elements

All Yocto-modules share a number of common functionalities.

USB connector

Yoctopuce modules all come with a micro-B USB socket. The corresponding cables are not the most common, but the sockets are the smallest available.

Warning: the USB connector is simply soldered in surface and can be pulled out if the USB plug acts as a lever. In this case, if the tracks stayed in position, the connector can be soldered back with a good iron and using flux to avoid bridges. Alternatively, you can solder a USB cable directly in the 1.27mm-spaced holes near the connector.

Yocto-button

The Yocto-button has two functionalities. First, it can activate the Yocto-beacon mode (see below under Yocto-led). Second, if you plug in a Yocto-module while keeping this button pressed, you can then reprogram its firmware with a new version. Note that there is a simpler UI-based method to update the firmware, but this one works even in case of severely damaged firmware.

Yocto-led

Normally, the Yocto-led is used to indicate that the module is working smoothly. The Yocto-led then emits a low blue light which varies slowly, mimicking breathing. The Yocto-led stops breathing when the module is not communicating any more, as for instance when powered by a USB hub which is disconnected from any active computer.

When you press the Yocto-button, the Yocto-led switches to Yocto-beacon mode. It starts flashing faster with a stronger light, in order to facilitate the localization of a module when you have several identical ones. It is indeed possible to trigger off the Yocto-beacon by software, as it is possible to detect by software that a Yocto-beacon is on.

The Yocto-led has a third functionality, which is less pleasant: when the internal software which controls the module encounters a fatal error, the Yocto-led starts emitting an SOS in morse [1]. If this happens, unplug and re-plug the module. If it happens again, check that the module contains the latest version of the firmware, and, if it is the case, contact Yoctopuce support[2].

Current sensor

Each Yocto-module is able to measure its own current consumption on the USB bus. Current supply on a USB bus being quite critical, this functionality can be of great help. You can only view the current consumption of a module by software.

Serial number

Each Yocto-module has a unique serial number assigned to it at the factory. For Yocto-Demo modules, this number starts with YCTOPOC1. The module can be software driven using this serial number. The serial number cannot be modified.

Logical name

The logical name is similar to the serial number: it is a supposedly unique character string which allows you to reference your module by software. However, in the opposite of the serial number, the logical name can be modified at will. The benefit is to enable you to build several copies of the same project without needing to modify the driving software. You only need to program the same logical name in each copy. Warning: the behavior of a project becomes unpredictable when it contains several modules with the same logical name and when the driving software tries to access one of these modules through its logical name. When leaving the factory, modules do not have an assigned logical name. It is yours to define.

2.2. Specific elements

Test led

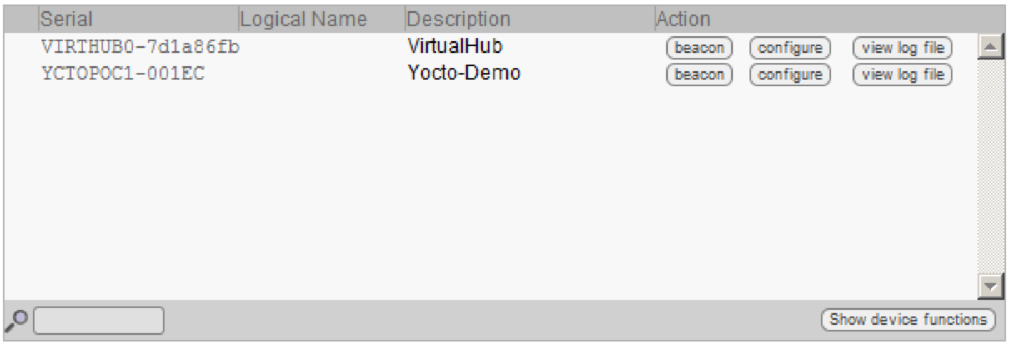
The Yocto-Demo module is almost useless: it is conceived to allow you to test the Yoctopuce programming APIs. This explains why Yocto-Demo is a basic module equipped with a simple green led on top of the Yocto-led. Once you understand how to pilot this led from your preferred programming language, it is very likely that you will also know how to control any other Yoctopuce module.

[1] short-short-short long-long-long short-short-short
[2] support@yoctopuce.com

3. First steps

When reading this chapter, your Yocto-Demo should be connected to your computer, which should have recognized it. It is time to make it work.

Go to the Yoctopuce web site and download the *Virtual Hub* software[1]. It is available for Windows, Linux, and Mac OS X. Normally, the Virtual Hub software serves as an abstraction layer for languages which cannot access the hardware layers of your computer. However, it also offers a succinct interface to configure your modules and to test their basic functions. You access this interface with a simple web browser[2]. Start the *Virtual Hub* software in a command line, open your preferred web browser and enter the URL *http://127.0.0.1:4444*. The list of the Yoctopuce modules connected to your computer is displayed.



Module list as displayed in your web bowser.

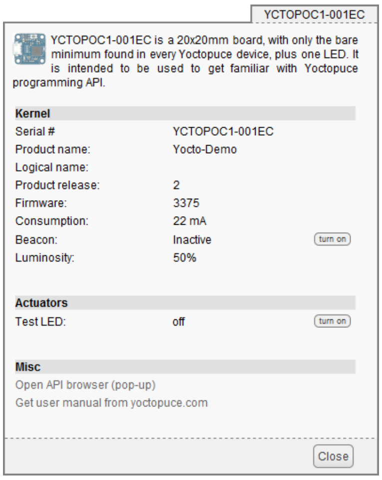
3.1. Localization

You can then physically localize each of the displayed modules by clicking on the **beacon** button. This puts the Yocto-led of the corresponding module in Yocto-beacon mode. It starts flashing, which allows you to easily localize it. The second effect is to display a little blue circle on the screen. You obtain the same behavior when pressing the Yocto-button of the module.

3.2. Test of the module

The first item to check is that your module is working well: click on the serial number corresponding to your module. This displays a window summarizing the properties of your Yocto-Demo.

1 www.yoctopuce.com/EN/virtualhub.php
2 The interface was tested on FireFox 3+, IE 6+, Safari, and Chrome.

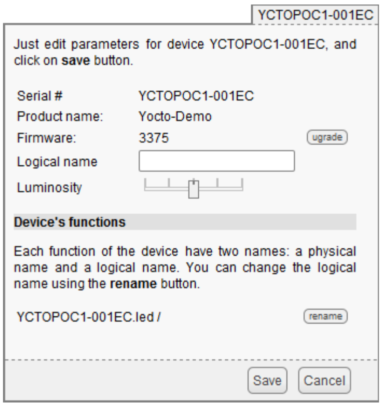


Properties of the Yocto-Demo module.

This window allows you to play with the test led. Notice how the module consumption varies slightly according to the state of the test led.

3.3. Configuration

When, in the module list, you click on the **configure** button corresponding to your module, the configuration window is displayed.



Yocto-Demo module configuration.

Firmware

The module firmware can easily be updated with the help of the interface. To do so, you must beforehand have the adequate firmware on your local disk. Firmware destined for Yoctopuce modules are available as .byn files and can be downloaded from the Yoctopuce web site.

To update a firmware, simply click on the **upgrade** button on the configuration window and follow the instructions. If the update fails for one reason or another, unplug and re-plug the module and start the update process again. This solves the issue in most cases. If the module was unplugged while it was being reprogrammed, it does probably not work anymore and is not listed in the interface. However, it is always possible to reprogram the module correctly by using the *Virtual Hub* software [3] in command line [4].

Logical name of the module

The logical name is a name that you choose, which allows you to access your module, in the same way a file name allows you to access its content. A logical name has a maximum length of 19 characters. Authorized characters are `A..Z`, `a..z`, `0..9`, `_`, and `-`. If you assign the same logical name

[3] www.yoctopuce.com/EN/virtualhub.php
[4] More information available in the virtual hub documentation

to two modules connected to the same computer and you try to access one of them through this logical name, behavior is undetermined: you have no way of knowing which of the two modules answers.

Luminosity

This parameter allows you to act on the maximal intensity of the leds of the module. This enables you, if necessary, to make it a little more discreet, while limiting its power consumption. Note that this parameter acts on all the signposting leds of the module, including the Yocto-led. If you connect a module and no led turns on, it may mean that its luminosity was set to zero.

Logical names of functions

Each Yoctopuce module has a serial number and a logical name. In the same way, each function on each Yoctopuce module has a hardware name and a logical name, the latter can be freely chosen by the user. Using logical names for functions provides a greater flexibility when programming modules.

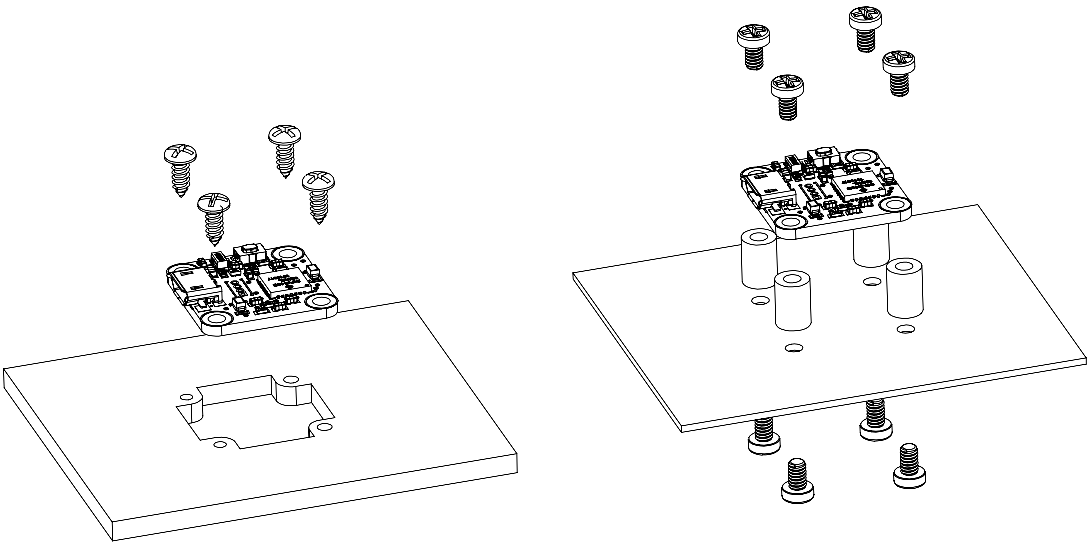
The only function of the Yocto-Demo module is the test led, of which the hardware name is `led`.

4. Assembly and connections

This chapter provides important information regarding the use of the Yocto-Demo module in real-world situations. Make sure to read it carefully before going too far into your project if you want to avoid pitfalls.

4.1. Fixing

While developing your project, you can simply let the module hang at the end of its cable. Check only that it does not come in contact with any conducting material (such as your tools). When your project is almost at an end, you need to find a way for your modules to stop moving around.



Examples of assembly on supports

The Yocto-Demo module contains 2.5mm assembly holes. You can use these holes for screws. The screw head diameter must not be larger than 4.5mm or they will damage the module circuits. Make sure that the lower surface of the module is not in contact with the support. We recommend using spacers, but other methods are possible. Nothing prevents you from fixing the module with a glue gun; it will not be good-looking, but it will hold.

If your intend to screw your module directly against a conducting part, for example a metallic frame, insert an isolating layer in between. Otherwise you are bound to induce a short circuit: there are naked pads under your module. Simple packaging tape should be enough for electric insulation.

4.2. USB power distribution

Although USB means *Universal Serial BUS*, USB devices are not physically organized as a flat bus but as a tree, using point-to-point connections. This has consequences on power distribution: to make it simple, every USB port must supply power to all devices directly or indirectly connected to it. And USB puts some limits.

In theory, a USB port provides 100mA, and may provide up to 500mA if available and requested by the device. In the case of a hub without external power supply, 100mA are available for the hub itself, and the hub should distribute no more than 100mA to each of its ports. This is it, and this is not much. In particular, it means that in theory, it is not possible to connect USB devices through two cascaded hubs without external power supply. In order to cascade hubs, it is necessary to use self-powered USB hubs, that provide a full 500mA to each subport.

In practice, USB would not have been as successful if it was really so picky about power distribution. As it happens, most USB hub manufacturers have been doing savings by not implementing current limitation on ports: they simply connect the computer power supply to every port, and declare themselves as *self-powered hub* even when they are taking all their power from the USB bus (in order to prevent any power consumption check in the operating system). This looks a bit dirty, but given the fact that computer USB ports are usually well protected by a hardware current limitation around 2000mA, it actually works in every day life, and seldom makes hardware damage.

What you should remember: if you connect Yoctopuce modules through one, or more, USB hub without external power supply, you have no safe-guard and you depend entirely on your computer manufacturer attention to provide as much current as possible on the USB ports, and to detect overloads before they lead to problems or to hardware damages. When modules are not provided enough current, they may work erratically and create unpredictable bugs. If you want to prevent any risk, do not cascade hubs without external power supply, and do not connect peripherals requiring more than 100mA behind a bus-powered hub.

In order to help controlling and planning overall power consumption for your project, all Yoctopuce modules include a built-in current sensor that tells (with 5mA precision) the consumption of the module on the USB bus.

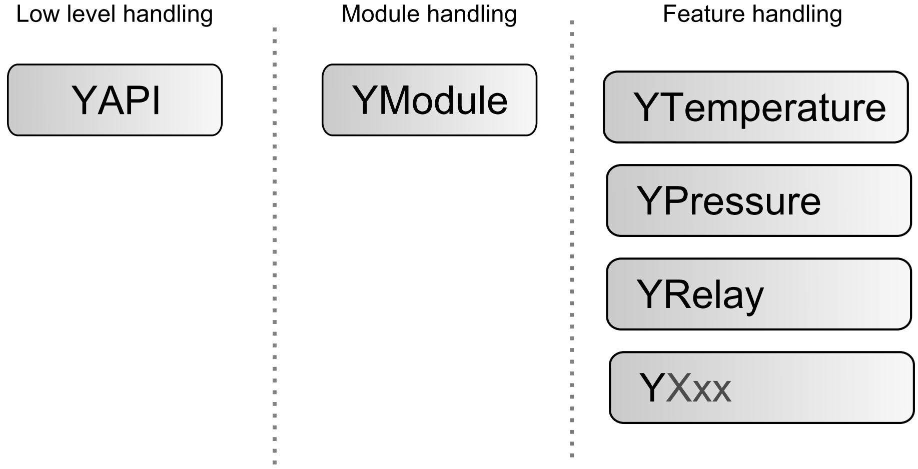
5. Programming, general concepts

The Yoctopuce API was designed to be at the same time simple to use and sufficiently generic for the concepts used to be valid for all the modules in the Yoctopuce range, and this in all the available programming languages. Therefore, when you have understood how to drive your Yocto-Demo with your favorite programming language, learning to use another module, even with a different language, will most likely take you only a minimum of time.

5.1. Programming paradigm

The Yoctopuce API is object oriented. However, for simplicity's sake, only the basics of object programming were used. Even if you are not familiar with object programming, it is unlikely that this will be a hinderance for using Yoctopuce products. Note that you will never need to allocate or deallocate an object linked to the Yoctopuce API: it is automatically managed.

There is one class per Yoctopuce function type. The name of these classes always starts with a Y followed by the name of the function, for example *YTemperature*, *YRelay*, *YPressure*, etc.. There is also a *YModule* class, dedicated to managing the modules themselves, and finally there is the static YAPI class, that supervises the global workings of the API and manages low level communications.



Structure of the Yoctopuce API.

In the Yoctopuce API, priority was put on the ease of access to the module functions by offering the possibility to make abstractions of the modules implementing them. Therefore, it is quite possible to work with a set of functions without ever knowing exactly which module are hosting them at the hardware level. This tremendously simplifies programming projects with a large number of modules.

From the programming stand point, your Yocto-Demo is viewed as a module hosting a given number of functions. In the API, these functions are objects which can be found independently, in several ways.

Access to the functions of a module

Access by logical name
Each function can be assigned an arbitrary and persistent logical name: this logical name is stored in the flash memory of the module, even if this module is disconnected. An object corresponding to an *Xxx* function to which a logical name has been assigned can then be directly found with this logical name and the *YXxx.FindXxx* method. Note however that a logical name must be unique among all the connected modules.

Access by enumeration
You can enumerate all the functions of the same type on all the connected modules with the help of the classic enumeration functions *FirstXxx* and *nextXxxx* available for each *YXxx* class.

Access by hardware name
Each module function has a hardware name, assigned at the factory and which cannot be modified. The functions of a module can also be found directly with this hardware name and the *YXxx.FindXxx* function of the corresponding class.

Difference between *Find* and *First*
The *YXxx.FindXxxx* and *YXxx.FirstXxxx* methods do not work exactly the same way. If there is no available module, *YXxx.FirstXxxx* returns a null value. On the opposite, even if there is no corresponding module, *YXxx.FindXxxx* returns a valid object, which is not online but which could become so if the corresponding module is later connected.

Function handling

When the object corresponding to a function is found, its methods are available in a classic way. Note that most of these subfunctions require the module hosting the function to be connected in order to be handled. This is generally not guaranteed, as a USB module can be disconnected after the control software has started. The *isOnline* method, available in all the classes, is then very helpful.

Access to the modules

Even if it is perfectly possible to build a complete project while making a total abstraction of which function is hosted on which module, the modules themselves are also accessible from the API. In fact, they can be handled in a way quite similar to the functions. They are assigned a serial number at the factory which allows you to find the corresponding object with *YModule.Find()*. You can also assign arbitrary logical names to the modules to make finding them easier. Finally, the *YModule* class contains the *YModule.FirstModule()* and *nextModule()* enumeration methods allowing you to list the connected modules.

Functions/Module interaction

From the API standpoint, the modules and their functions are strongly uncorrelated by design. Nevertheless, the API provides the possibility to go from one to the other. Thus, the *get_module()* method, available for each function class, allows you to find the object corresponding to the module hosting this function. Inversely, the *YModule* class provides several methods allowing you to enumerate the functions available on a module.

5.2. The Yocto-Demo module

The Yocto-Demo module provides a single instance of the Led function, corresponding to the only test led present on the module.

module : Module

attribute	type	modifiable ?
productName	String	read-only
serialNumber	String	read-only
logicalName	String	modifiable
productId	Hexadecimal number	read-only
productRelease	Hexadecimal number	read-only
firmwareRelease	String	read-only
persistentSettings	Enumerated	modifiable
luminosity	0..100%	modifiable
beacon	On/Off	modifiable
upTime	Time	read-only
usbCurrent	Used current (mA)	read-only
rebootCountdown	Integer	modifiable
userVar	Integer	modifiable

led : Led

attribute	type	modifiable ?
logicalName	String	modifiable
advertisedValue	String	read-only
power	On/Off	modifiable
luminosity	0..100%	modifiable
blinking	Enumerated	modifiable

5.3. Module control interface

This interface is identical for all Yoctopuce USB modules. It can be used to control the module global parameters, and to enumerate the functions provided by each module.

productName

Character string containing the commercial name of the module, as set by the factory.

serialNumber

Character string containing the serial number, unique and programmed at the factory. For a Yocto-Demo module, this serial number always starts with YCTOPOC1. You can use the serial number to access a given module by software.

logicalName

Character string containing the logical name of the module, initially empty. This attribute can be modified at will by the user. Once initialized to an non-empty value, it can be used to access a given module. If two modules with the same logical name are in the same project, there is no way to determine which one answers when one tries accessing by logical name. The logical name is limited to 19 characters among `A..Z`,`a..z`,`0..9`,`_`, and `-`.

productId

USB device identifier of the module, preprogrammed to 9 at the factory.

productRelease

Release number of the module hardware, preprogrammed at the factory.

firmwareRelease

Release version of the embedded firmware, changes each time the embedded software is updated.

persistentSettings

State of persistent module settings: loaded from flash memory, modified by the user or saved to flash memory.

luminosity

Lighting strength of the informative leds (e.g. the Yocto-Led) contained in the module. It is an integer value which varies between 0 (leds turned off) and 100 (maximum led intensity). The default value is 50. To change the strength of the module leds, or to turn them off completely, you only need to change this value.

beacon

Activity of the localization beacon of the module.

upTime

Time elapsed since the last time the module was powered on.

usbCurrent

Current consumed by the module on the USB bus, in milli-amps.

rebootCountdown

Countdown to use for triggering a reboot of the module.

userVar

32bit integer variable available for user storage.

5.4. Led function interface

Yoctopuce application programming interface allows you not only to drive the intensity of the led, but also to have it blink at various preset frequencies.

logicalName

Character string containing the logical name of the led, initially empty. This attribute can be modified at will by the user. Once initialized to an non-empty value, it can be used to access the led directly. If two leds with the same logical name are used in the same project, there is no way to determine which one answers when one tries accessing by logical name. The logical name is limited to 19 characters among `A..Z`,`a..z`,`0..9`,`_`, and `-`.

advertisedValue

Short character string summarizing the current state of the led, that will be automatically be advertised up to the parent hub. For a led, the advertised value is the state the led (OFF, ON) or its signaling mode if blinking (RELAX, AWARE, RUN, CALL or PANIC).

power

Current state of the test led. Possible values are: OFF and ON.

luminosity

Maximal test led intensity, in per cent. This attribute makes it possible to precisely control the led luminosity, when a simple OFF/ON state is not enough. The led will turn to state OFF when the luminosity is set to 0, and to state ON when the luminosity is set to a non-zero value.

blinking

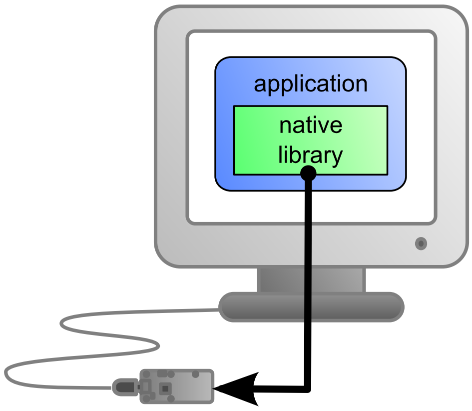
Current signaling mode of the led, that determines whether its intensity varies et at which frequency. Possible values are: STILL (no blinking), RELAX (blinking every 4 seconds), AWARE (every 2 seconds), RUN (every second), CALL (twice per second) ou PANIC (4 times per second).

5.5. What interface: Native, DLL or Service ?

There are several methods to control you Yoctopuce module by software.

Native control

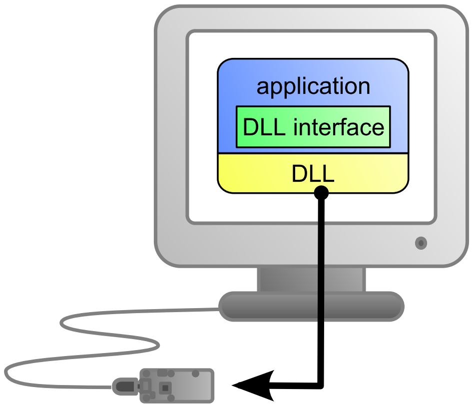
In this case, the software driving your project is compiled directly with a library which provides control of the modules. Objectively, it is the simplest and most elegant solution for the end user. The end user then only needs to plug the USB cable and run your software for everything to work. Unfortunately, this method is not always available or even possible.



The application uses the native library to control the locally connected module

Native control by DLL

Here, the main part of the code controlling the modules is located in a DLL. The software is compiled with a small library which provides control of the DLL. It is the fastest method to code module support in a given language. Indeed, the "useful" part of the control code is located in the DLL which is the same for all languages: the effort to support a new language is limited to coding the small library which controls the DLL. From the end user stand point, there are few differences: one must simply make sure that the DLL is installed on the end user's computer at the same time as the main software.



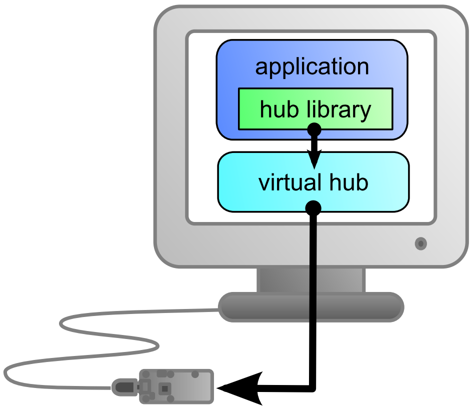
The application uses the DLL to natively control the locally connected module

Control by service

Some languages do simply not allow you to easily gain access to the hardware layers of the machine. It is the case for Javascript, for instance. To deal with this case, Yoctopuce provides a solution in the form of a small piece of software called *Virtual Hub*[1]. It can access the modules, and your application only needs to use a library which offers all necessary functions to control the modules via this virtual hub. The end users will have to start the virtual hub before running the project

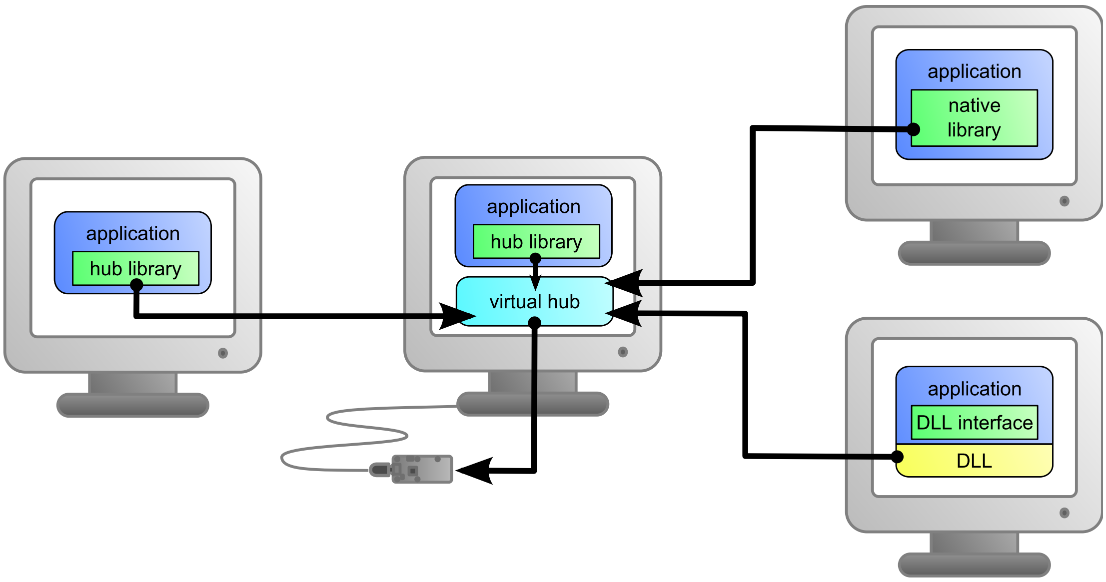
[1] www.yoctopuce.com/EN/virtualhub.php

control software itself, unless they decide to install the hub as a service/deamon, in which case the virtual hub starts automatically when the machine starts up.



The application connects itself to the virtual hub to gain access to the module

The service control method comes with a non-negligible advantage: the application does not need to run on the machine on which the modules are connected. The application can very well be located on another machine which connects itself to the service to drive the modules. Moreover, the native libraries and DLL mentioned above are also able to connect themselves remotely to one or several virtual hubs.



When a virtual hub is used, the control application does not need to reside on the same machine as the module.

Whatever the selected programming language and the control paradigm used, programming itself stays strictly identical. From one language to another, functions bear exactly the same name, and have the same parameters. The only differences are linked to the constraints of the languages themselves.

Language	Native	Native with DLL	Virtual hub
C++	•	•	•
Objective-C	•	-	•
Delphi	-	•	•
Python	-	•	•
VisualBasic .Net	-	•	•
C# .Net	-	•	•
Javascript	-	-	•
Node.js	-	-	•
PHP	-	-	•
Java	-	-	•
Java for Android	•	-	•
Command line	•	-	•

Support methods for different languages

Limitations of the Yoctopuce libraries

Natives et DLL libraries have a technical limitation. On the same computer, you cannot concurrently run several applications accessing Yoctopuce devices directly. If you want to run several projects on the same computer, make sure your control applications use Yoctopuce devices through a *VirtualHub* software. The modification is trivial: it is just a matter of parameter change in the `yRegisterHub()` call.

5.6. Programming, where to start?

At this point of the user's guide, you should know the main theoretical points of your Yocto-Demo. It is now time to practice. You must download the Yoctopuce library for your favorite programming language from the Yoctopuce web site[2]. Then skip directly to the chapter corresponding to the chosen programming language.

All the examples described in this guide are available in the programming libraries. For some languages, the libraries also include some complete graphical applications, with their source code.

When you have mastered the basic programming of your module, you can turn to the chapter on advanced programming that describes some techniques that will help you make the most of your Yocto-Demo.

2 http://www.yoctopuce.com/EN/libraries.php

6. Using the Yocto-Demo in command line

When you want to perform a punctual operation on your Yocto-Demo, such as reading a value, assigning a logical name, and so on, you can obviously use the Virtual Hub, but there is a simpler, faster, and more efficient method: the command line API.

The command line API is a set of executables, one by type of functionality offered by the range of Yoctopuce products. These executables are provided pre-compiled for all the Yoctopuce officially supported platforms/OS. Naturally, the executable sources are also provided[1].

6.1. Installing

Download the command line API[2]. You do not need to run any setup, simply copy the executables corresponding to your platform/OS in a directory of your choice. You may add this directory to your PATH variable to be able to access these executables from anywhere. You are all set, you only need to connect your Yocto-Demo, open a shell, and start working by typing for example:

```
C:\>YLed any set_power ON

C:\>YLed any set_blinking RELAX
```

To use the command API on Linux, you need either have root privileges or to define an *udev* rule for your system. See the *Troubleshooting* chapter for more details.

6.2. Use: general description

All the command line API executables work on the same principle. They must be called the following way

```
C:\>Executable [options] [target] command [parameter]
```

`[options]` manage the global workings of the commands, they allow you, for instance, to pilot a module remotely through the network, or to force the module to save its configuration after executing the command.

`[target]` is the name of the module or of the function to which the command applies. Some very generic commands do not need a target. You can also use the aliases "*any*" and "*all*", or a list of names separated by comas without space.

[1] If you want to recompile the command line API, you also need the C++ API.
[2] http://www.yoctopuce.com/EN/libraries.php

`command` is the command you want to run. Almost all the functions available in the classic programming APIs are available as commands. You need to respect neither the case nor the underlined characters in the command name.

`[parameters]` logically are the parameters needed by the command.

At any time, the command line API executables can provide a rather detailed help. Use for instance:

```
C:\>executable /help
```

to know the list of available commands for a given command line API executable, or even:

```
C:\>executable command /help
```

to obtain a detailed description of the parameters of a command.

6.3. Control of the Led function

To control the Led function of your Yocto-Demo, you need the YLed executable file.

For instance, you can launch:

```
C:\>YLed any set_power ON

C:\>YLed any set_blinking RELAX
```

This example uses the "*any*" target to indicate that we want to work on the first Led function found among all those available on the connected Yoctopuce modules when running. This prevents you from having to know the exact names of your function and of your module.

But you can use logical names as well, as long as you have configured them beforehand. Let us imagine a Yocto-Demo module with the *YCTOPOC1-123456* serial number which you have called "*MyModule*", and its led function which you have renamed "*MyFunction*". The five following calls are strictly equivalent (as long as *MyFunction* is defined only once, to avoid any ambiguity).

```
C:\>YLed YCTOPOC1-123456.led describe

C:\>YLed YCTOPOC1-123456.MyFunction describe

C:\>YLed MyModule.led describe

C:\>YLed MyModule.MyFunction describe

C:\>YLed MyFunction describe
```

To work on all the Led functions at the same time, use the "*all*" target.

```
C:\>YLed all describe
```

For more details on the possibilities of the `YLed` executable, use:

```
C:\>YLed /help
```

6.4. Control of the module part

Each module can be controlled in a similar way with the help of the `YModule` executable. For example, to obtain the list of all the connected modules, use:

```
C:\>YModule inventory
```

You can also use the following command to obtain an even more detailed list of the connected modules:

```
C:\>YModule all describe
```

Each `xxx` property of the module can be obtained thanks to a command of the `get_xxxx()` type, and the properties which are not read only can be modified with the `set_xxx()` command. For example:

```
C:\>YModule YCTOPOC1-12346 set_logicalName MonPremierModule

C:\>YModule YCTOPOC1-12346 get_logicalName
```

Changing the settings of the module

When you want to change the settings of a module, simply use the corresponding `set_xxx` command. However, this change happens only in the module RAM: if the module restarts, the changes are lost. To store them permanently, you must tell the module to save its current configuration in its nonvolatile memory. To do so, use the `saveToFlash` command. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash` method. For example:

```
C:\>YModule YCTOPOC1-12346 set_logicalName MonPremierModule
C:\>YModule YCTOPOC1-12346 saveToFlash
```

Note that you can do the same thing in a single command with the `-s` option.

```
C:\>YModule -s  YCTOPOC1-12346 set_logicalName MonPremierModule
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

6.5. Limitations

The command line API has the same limitation than the other APIs: there can be only one application at a given time which can access the modules natively. By default, the command line API works in native mode.

You can easily work around this limitation by using a Virtual Hub: run the VirtualHub[3] on the concerned machine, and use the executables of the command line API with the `-r` option. For example, if you use:

```
C:\>YModule  inventory
```

you obtain a list of the modules connected by USB, using a native access. If another command which accesses the modules natively is already running, this does not work. But if you run a Virtual Hub, and you give your command in the form:

```
C:\>YModule -r 127.0.0.1 inventory
```

it works because the command is not executed natively anymore, but through the Virtual Hub. Note that the Virtual Hub counts as a native application.

3 http://www.yoctopuce.com/EN/virtualhub.php

7. Using Yocto-Demo with Javascript

Javascript is probably not the first language that comes to mind to control hardware, but its ease of use is a great advantage: with Javascript, you only need a text editor and a web browser to realize your first tests.

Javascript is one of those languages which do not allow you to directly access the hardware layers of your computer. Therefore you need to run the Yoctopuce TCP/IP to USB gateway, named *VirtualHub*, on the machine on which your modules are connected.

7.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The Javascript programming library[1]
- The VirtualHub software[2] for Windows, Mac OS X or Linux, depending on your OS

Decompress the library files in a folder of your choice, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

7.2. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a JavaScript code snipplet to use the Led function.

```
<SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
<SCRIPT type="text/javascript" src="yocto_led.js"></SCRIPT>

// Get access to your device, through the VirtualHub running locally
yRegisterHub('http://127.0.0.1:4444/');
var led = yFindLed("YCTOPOC1-123456.led");

// Check that the module is online to handle hot-plug
if(led.isOnline())
{
    // Use led.set_power(), ...
}
```

Let us look at these lines in more details.

[1] www.yoctopuce.com/EN/libraries.php
[2] www.yoctopuce.com/EN/virtualhub.php

yocto_api.js and yocto_led.js

These two Javascript includes provide access to functions allowing you to manage Yoctopuce modules. `yocto_api.js` must always be included, `yocto_led.js` is necessary to manage modules containing a led, such as Yocto-Demo.

yRegisterHub

The `yRegisterHub` function allows you to indicate on which machine the Yoctopuce modules are located, more precisely on which machine the VirtualHub software is running. In our case, the `127.0.0.1:4444` address indicates the local machine, port `4444` (the standard port used by Yoctopuce). You can very well modify this address, and enter the address of another machine on which the VirtualHub software is running.

yFindLed

The `yFindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can also use logical names, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
var led = yFindLed("YCTOPOC1-123456.led");
var led = yFindLed("YCTOPOC1-123456.MyFunction");
var led = yFindLed("MyModule.led");
var led = yFindLed("MyModule.MyFunction");
var led = yFindLed("MyFunction");
```

`yFindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `yFindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `yFindLed` allows you to turn on and off the led. The argument is Y_POWER_ON or Y_POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Open your preferred text editor[3], copy the code sample below, save it in the same directory as the Yoctopuce library files and then use your preferred web browser to access this page. The code is also provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

The example is coded to be used either from a web server, or directly by opening the file on the local machine. Note that this latest solution does not work with some versions of Internet Explorer, in particular IE 9 on Windows 7, which is not able to open network connections when working on a local file. In order to use Internet Explorer, you should load the example from a web server. No such problem exists with Chrome, Firefox or Safari.

If your Yocto-Demo is not connected on the host running the browser, replace in the example the address `127.0.0.1` by the IP address of the host on which the Yocto-Demo is connected and where you run the VirtualHub.

[3] If you do not have a text editor, use Notepad rather than Microsoft Word.

```
<HTML>
<HEAD>
 <TITLE>Hello World</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT type="text/javascript" src="yocto_led.js"></SCRIPT>
 <SCRIPT language='javascript1.5' type='text/JavaScript'>
 <!--
 // Use explicit error handling rather than exceptions
 yDisableExceptions();

 // Setup the API to use the VirtualHub on local machine
 if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
     alert("Cannot contact VirtualHub on 127.0.0.1");
 }

 var led;

 function refresh()
 {
     var serial = document.getElementById('serial').value;
     if(serial == '') {
         // Detect any conected module suitable for the demo
         led = yFirstLed();
         if(led) {
             serial = led.module().get_serialNumber();
             document.getElementById('serial').value = serial;
         }
     }

     led = yFindLed(serial+".led");
     if(led.isOnline()) {
         document.getElementById('msg').value = '';
     } else {
         document.getElementById('msg').value = 'Module not connected';
     }
     setTimeout('refresh()',500);
 }

 function switchIt(state)
 {
     if (state) led.set_power(Y_POWER_ON);
           else led.set_power(Y_POWER_OFF);
 }
 -->
 </SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 Module to use: <input id='serial'>
 <input id='msg' style='color:red;border:none;' readonly><br>
 <a href='javascript:switchIt(true);'>ON</a><br>
 <a href='javascript:switchIt(false);'>OFF</a>
</BODY>
</HTML>
```

7.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
<HTML>
<HEAD>
 <TITLE>Module Control</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT language='javascript1.5'  type='text/JavaScript'>
 <!--
 // Use explicit error handling rather than exceptions
 yDisableExceptions();

 // Setup the API to use the VirtualHub on local machine
 if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
     alert("Cannot contact VirtualHub on 127.0.0.1");
 }
```

```
 var module;

 function refresh()
 {
     var serial = document.getElementById('serial').value;
     if(serial == '') {
         // Detect any conected module suitable for the demo
         module = yFirstModule().nextModule();
         if(module) {
             serial = module.get_serialNumber();
             document.getElementById('serial').value = serial;
         }
     }

     module = yFindModule(serial);
     if(module.isOnline()) {
         document.getElementById('msg').value = '';
         var html = 'serial: '+module.get_serialNumber()+'<br>';
         html += 'logical name: '+module.get_logicalName()+'<br>';
         html += 'luminosity:'+module.get_luminosity()+'%<br>';
         html += 'beacon:';
         if (module.get_beacon()==Y_BEACON_ON)
             html+="ON <a href='javascript:beacon(Y_BEACON_OFF)'>switch off</a><br>";
         else
             html+="OFF <a href='javascript:beacon(Y_BEACON_ON)'>switch on</a><br>";

         html += 'upTime: '+parseInt(module.get_upTime()/1000)+' sec<br>';
         html += 'USB current: '+module.get_usbCurrent()+' mA<br>';
         html += 'logs:<br><pre>'+module.get_lastLogs()+'</pre><br>';
         document.getElementById('data').innerHTML = html;
     } else {
         document.getElementById('msg').value = 'Module not connected';
     }
     setTimeout('refresh()',1000);
 }

 function beacon(state)
 {
     module.set_beacon(state);
 }
 -->
 </SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 Module to use: <input id='serial'>
 <input id='msg' style='color:red;border:none;' readonly><br>
 <span id='data'></span>
</BODY>
</HTML>
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
<HTML>
<HEAD>
 <TITLE>Change module settings</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT    type='text/JavaScript'>
 <!--
 // Use explicit error handling rather than exceptions
 yDisableExceptions();

 // Setup the API to use the VirtualHub on local machine
```

```
 if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
     alert("Cannot contact VirtualHub on 127.0.0.1");
 }

 var module;

 function refresh()
 {
     var serial = document.getElementById('serial').value;
     if(serial == '') {
         // Detect any conected module suitable for the demo
         module = yFirstModule().nextModule();
         if(module) {
             serial = module.get_serialNumber();
             document.getElementById('serial').value = serial;
         }
     }

     module = yFindModule(serial);
     if(module.isOnline()) {
         document.getElementById('msg').value = '';
         document.getElementById('curName').value = module.get_logicalName();
     } else {
         document.getElementById('msg').value = 'Module not connected';
     }
     setTimeout('refresh()',1000);
 }

 function save()
 {
     var newname = document.getElementById('newName').value;
     if (!yCheckLogicalName(newname)) {
         alert('invalid logical name');
         return;
     }
     module.set_logicalName(newname);
     module.saveToFlash();
 }
 -->
 </SCRIPT>
</HEAD>
<BODY onload='refresh();'>
 Module to use: <input id='serial'>
 <input id='msg' style='color:red;border:none;' readonly><br>
 Current name: <input id='curName' readonly><br>
 New logical name: <input id='newName'>
 <a href='javascript:save();'>Save</a>
</BODY>
</HTML>
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
<HTML>
<HEAD>
 <TITLE>Modules inventory</TITLE>
 <SCRIPT type="text/javascript" src="yocto_api.js"></SCRIPT>
 <SCRIPT    type='text/JavaScript'>
 <!--
 // Use explicit error handling rather than exceptions
 yDisableExceptions();

 // Setup the API to use the VirtualHub on local machine
 if(yRegisterHub('http://127.0.0.1:4444/') != YAPI_SUCCESS) {
```

```
        alert("Cannot contact VirtualHub on 127.0.0.1");
    }

    function refresh()
    {
        yUpdateDeviceList();

        var htmlcode = '';
        var module = yFirstModule();
        while(module) {
            htmlcode += module.get_serialNumber()
                        +'('+module.get_productName()+")<br>";
            module = module.nextModule();
        }
        document.getElementById('list').innerHTML=htmlcode;
        setTimeout('refresh()',500);
    }
    -->
    </SCRIPT>
</HEAD>
<BODY onload='refresh();'>
    <H1>Device list</H1>
    <tt><span id='list'></span></tt>
</BODY>
</HTML>
```

7.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

8. Using Yocto-Demo with PHP

PHP is, like Javascript, an atypical language when interfacing with hardware is at stakes. Nevertheless, using PHP with Yoctopuce modules provides you with the opportunity to very easily create web sites which are able to interact with their physical environment, and this is not available to every web server. This technique has a direct application in home automation: a few Yoctopuce modules, a PHP server, and you can interact with your home from anywhere on the planet, as long as you have an internet connection.

PHP is one of those languages which do not allow you to directly access the hardware layers of your computer. Therefore you need to run a virtual hub on the machine on which your modules are connected.

To start your tests with PHP, you need a PHP 5.3 (or more) server[1], preferably locally on you machine. If you wish to use the PHP server of your internet provider, it is possible, but you will probably need to configure your ADSL router for it to accept and forward TCP request on the 4444 port.

8.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The PHP programming library[2]
- The VirtualHub software[3] for Windows, Mac OS X, or Linux, depending on your OS

Decompress the library files in a folder of your choice accessible to your web server, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

8.2. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a PHP code snipplet to use the Led function.

```
include('yocto_api.php');
include('yocto_led.php');
```

[1] A couple of free PHP servers: easyPHP for Windows, MAMP for Mac OS X.
[2] www.yoctopuce.com/EN/libraries.php
[3] www.yoctopuce.com/EN/virtualhub.php

```
// Get access to your device, through the VirtualHub running locally
yRegisterHub('http://127.0.0.1:4444/',$errmsg);
$led = yFindLed("YCTOPOC1-123456.led");

// Check that the module is online to handle hot-plug
if(led->isOnline())
{
    // Use led->set_power(), ...
}
```

Let's look at these lines in more details.

yocto_api.php and yocto_led.php

These two PHP includes provides access to the functions allowing you to manage Yoctopuce modules. `yocto_api.php` must always be included, `yocto_led.php` is necessary to manage modules containing a led, such as Yocto-Demo.

yRegisterHub

The `yRegisterHub` function allows you to indicate on which machine the Yoctopuce modules are located, more precisely on which machine the VirtualHub software is running. In our case, the `127.0.0.1:4444` address indicates the local machine, port `4444` (the standard port used by Yoctopuce). You can very well modify this address, and enter the address of another machine on which the VirtualHub software is running.

yFindLed

The `yFindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
$led = yFindLed("YCTOPOC1-123456.led");
$led = yFindLed("YCTOPOC1-123456.MyFunction");
$led = yFindLed("MyModule.led");
$led = yFindLed("MyModule.MyFunction");
$led = yFindLed("MyFunction");
```

`yFindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `yFindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `yFindLed` allows you to turn on and off the led. The argument is Y_POWER_ON or Y_POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Open your preferred text editor[4], copy the code sample below, save it with the Yoctopuce library files in a location which is accessible to you web server, then use your preferred web browser to access this page. The code is also provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

[4] If you do not have a text editor, use Notepad rather than Microsoft Word.

```
<HTML>
<HEAD>
 <TITLE>Hello World</TITLE>
</HEAD>
<BODY>
<FORM method='get'>
<?php
  include('yocto_api.php');
  include('yocto_led.php');

  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1");
  }

  @$serial = $_GET['serial'];
  if ($serial != '') {
      // Check if a specified module is available online
      $led = yFindLed("$serial.led");
      if (!$led->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      $led = yFirstLed();
      if(is_null($led)) {
          die("No module connected (check USB cable)");
      } else {
          $serial = $led->module()->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  // Drive the selected module
  if (isset($_GET['state'])) {
      $state = $_GET['state'];
      if ($state=='OFF') $led->set_power(Y_POWER_OFF);
      if ($state=='ON')  $led->set_power(Y_POWER_ON);
  }
?>
<input type='radio' name='state' value='ON'>Turn led ON
<input type='radio' name='state' value='OFF'>Turn led OFF
<br><input type='submit'>
</FORM>
</BODY>
</HTML>
```

8.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
<HTML>
<HEAD>
 <TITLE>Module Control</TITLE>
</HEAD>
<BODY>
<FORM method='get'>
<?php
  include('yocto_api.php');

  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1 : ".$errmsg);
  }

  @$serial = $_GET['serial'];
```

```
  if ($serial != '') {
      // Check if a specified module is available online
      $module = yFindModule("$serial");
      if (!$module->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      $module = yFirstModule();
      if($module) { // skip VirtualHub
          $module = $module->nextModule();
      }
      if(is_null($module)) {
          die("No module connected (check USB cable)");
      } else {
          $serial = $module->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  if (isset($_GET['beacon'])) {
      if ($_GET['beacon']=='ON')
          $module->set_beacon(Y_BEACON_ON);
      else
          $module->set_beacon(Y_BEACON_OFF);
  }
  printf('serial: %s<br>',$module->get_serialNumber());
  printf('logical name: %s<br>',$module->get_logicalName());
  printf('luminosity: %s<br>',$module->get_luminosity());
  print('beacon: ');
  if($module->get_beacon() == Y_BEACON_ON) {
      printf("<input type='radio' name='beacon' value='ON' checked>ON ");
      printf("<input type='radio' name='beacon' value='OFF'>OFF<br>");
  } else {
      printf("<input type='radio' name='beacon' value='ON'>ON ");
      printf("<input type='radio' name='beacon' value='OFF' checked>OFF<br>");
  }
  printf('upTime: %s sec<br>',intVal($module->get_upTime()/1000));
  printf('USB current: %smA<br>',$module->get_usbCurrent());
  printf('logs:<br><pre>%s</pre>',$module->get_lastLogs());
?>
<input type='submit' value='refresh'>
</FORM>
</BODY>
</HTML>
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
<HTML>
<HEAD>
 <TITLE>save settings</TITLE>
<BODY>
<FORM method='get'>
<?php
  include('yocto_api.php');

  // Use explicit error handling rather than exceptions
  yDisableExceptions();

  // Setup the API to use the VirtualHub on local machine
  if(yRegisterHub('http://127.0.0.1:4444/',$errmsg) != YAPI_SUCCESS) {
      die("Cannot contact VirtualHub on 127.0.0.1");
```

```
  }

  @$serial = $_GET['serial'];
  if ($serial != '') {
      // Check if a specified module is available online
      $module = yFindModule("$serial");
      if (!$module->isOnline()) {
          die("Module not connected (check serial and USB cable)");
      }
  } else {
      // or use any connected module suitable for the demo
      $module = yFirstModule();
      if($module) { // skip VirtualHub
          $module = $module->nextModule();
      }
      if(is_null($module)) {
          die("No module connected (check USB cable)");
      } else {
          $serial = $module->get_serialnumber();
      }
  }
  Print("Module to use: <input name='serial' value='$serial'><br>");

  if (isset($_GET['newname'])){
      $newname = $_GET['newname'];
      if (!yCheckLogicalName($newname))
          die('Invalid name');
      $module->set_logicalName($newname);
      $module->saveToFlash();
  }
  printf("Current name: %s<br>", $module->get_logicalName());
  print("New name: <input name='newname' value='' maxlength=19><br>");
?>
<input type='submit'>
</FORM>
</BODY>
</HTML>
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

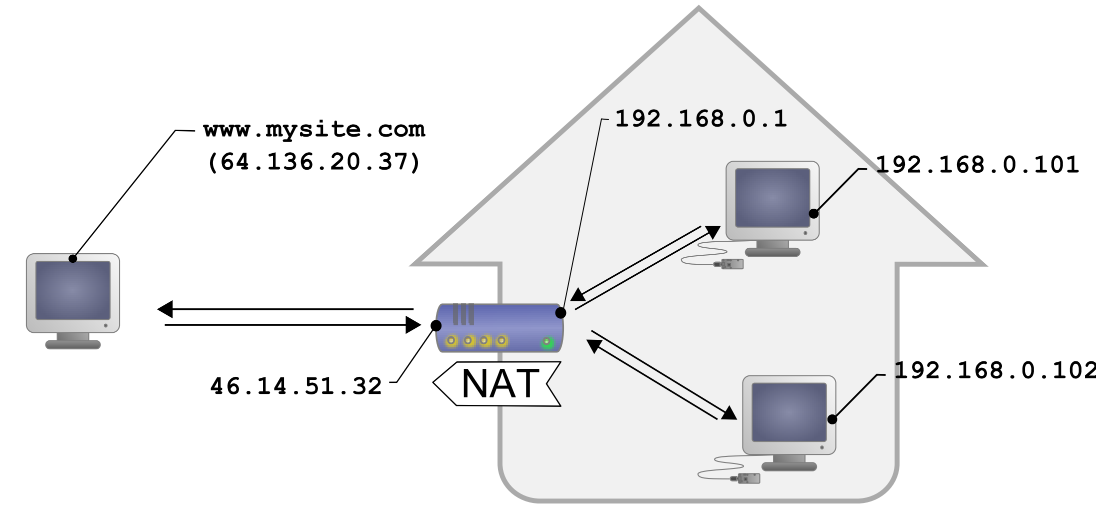
```
<HTML>
<HEAD>
 <TITLE>inventory</TITLE>
</HEAD>
<BODY>
<H1>Device list</H1>
<TT>
<?php
    include('yocto_api.php');
    yRegisterHub("http://127.0.0.1:4444/");
    $module   = yFirstModule();
    while (!is_null($module)) {
        printf("%s (%s)<br>", $module->get_serialNumber(),
               $module->get_productName());
        $module=$module->nextModule();
    }
?>
</TT>
</BODY>
</HTML>
```

8.4. HTTP callback API and NAT filters

The PHP library is able to work in a specific mode called *HTTP callback Yocto-API*. With this mode, you can control Yoctopuce devices installed behind a NAT filter, such as a DSL router for example, and this without needing to open a port. The typical application is to control Yoctopuce devices, located on a private network, from a public web site.

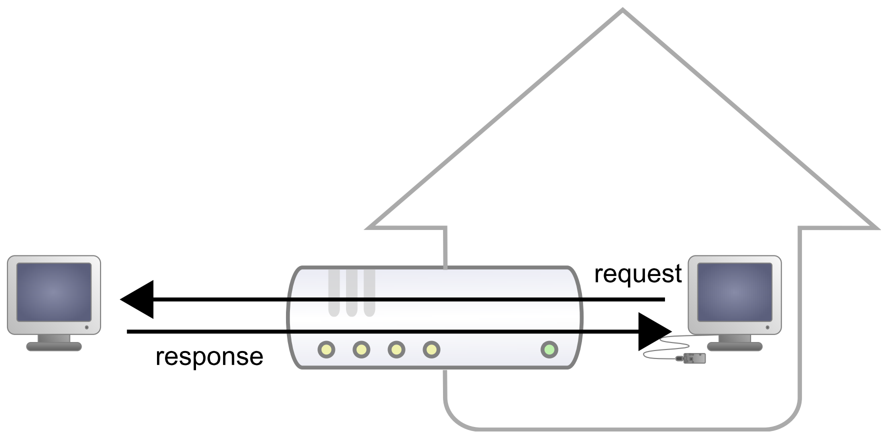
The NAT filter: advantages and disadvantages

A DSL router which translates network addresses (NAT) works somewhat like a private phone switchboard (a PBX): internal extensions can call each other and call the outside; but seen from the outside, there is only one official phone number, that of the switchboard itself. You cannot reach the internal extensions from the outside.

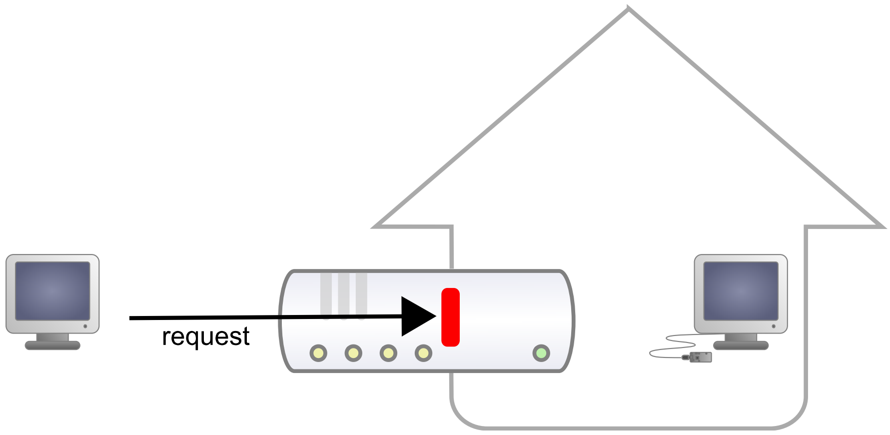


Typical DSL configuration: LAN machines are isolated from the outside by the DSL router

Transposed to the network, we have the following: appliances connected to your home automation network can communicate with one another using a local IP address (of the 192.168.xxx.yyy type), and contact Internet servers through their public address. However, seen from the outside, you have only one official IP address, assigned to the DSL router only, and you cannot reach your network appliances directly from the outside. It is rather restrictive, but it is a relatively efficient protection against intrusions.



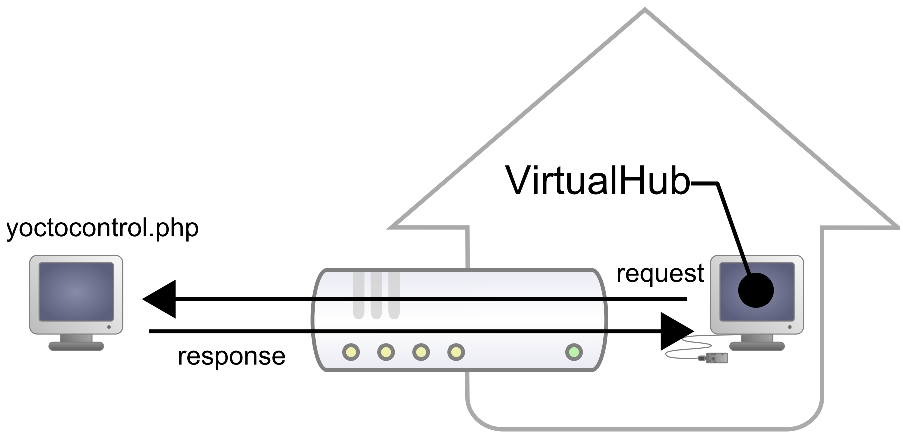
Responses from request from LAN machines are routed.



But requests from the outside are blocked.

Seeing Internet without being seen provides an enormous security advantage. However, this signifies that you cannot, a priori, set up your own web server at home to control a home automation installation from the outside. A solution to this problem, advised by numerous home automation system dealers, consists in providing outside visibility to your home automation server itself, by adding a routing rule in the NAT configuration of the DSL router. The issue of this solution is that it exposes the home automation server to external attacks.

The HTTP callback API solves this issue without having to modify the DSL router configuration. The module control script is located on an external site, and it is the *VirtualHub* which is in charge of calling it a regular intervals.



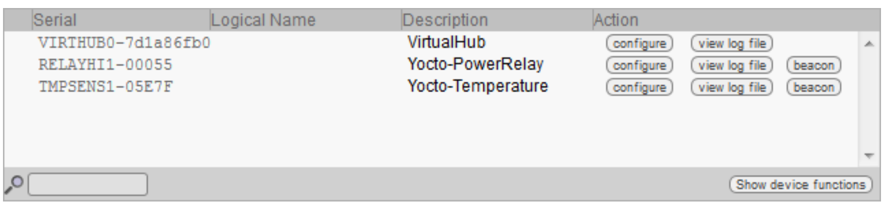
The HTTP callback API uses the VirtualHub which initiates the requests.

Configuration

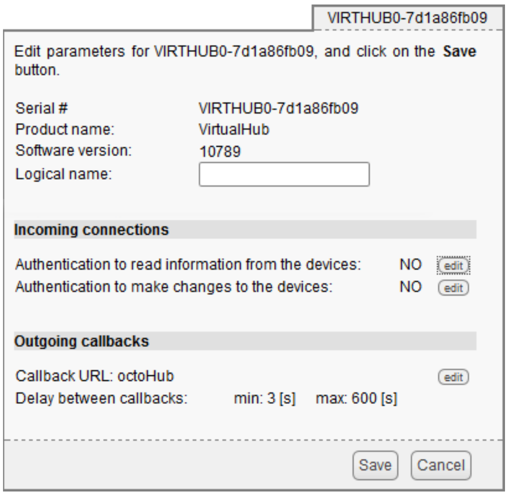
The callback API thus uses the *VirtualHub* as a gateway. All the communications are initiated by the *VirtualHub*. They are thus outgoing communications and therefore perfectly authorized by the DSL router.

You must configure the *VirtualHub* so that it calls the PHP script on a regular basis. To do so:

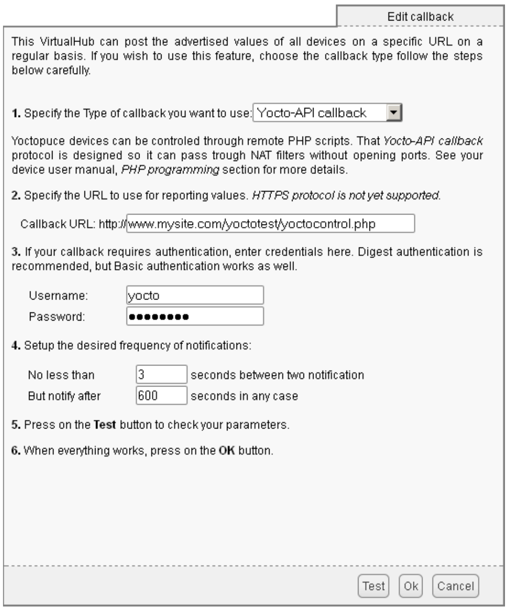
1. Launch a *VirtualHub*
2. Access its interface, usually 127.0.0.1:4444
3. Click on the **configure** button of the line corresponding to the *VirtualHub* itself
4. Click on the **edit** button of the **Outgoing callbacks** section



Click on the "configure" button on the first line



Click on the "edit" button of the "Outgoing callbacks" section



And select "Yocto-API callback".

You then only need to define the URL of the PHP script and, if need be, the user name and password to access this URL. Supported authentication methods are *basic* and *digest*. The second method is safer than the first one because it does not allow transfer of the password on the network.

Usage

From the programmer standpoint, the only difference is at the level of the *yRegisterHub* function call. Instead of using an IP address, you must use the *callback* string (or *http://callback* which is equivalent).

```
include("yocto_api.php");
yRegisterHub("callback");
```

The remainder of the code stays strictly identical. On the *VirtualHub* interface, at the bottom of the configuration window for the HTTP callback API , there is a button allowing you to test the call to the PHP script.

Be aware that the PHP script controlling the modules remotely through the HTTP callback API can be called only by the *VirtualHub*. Indeed, it requires the information posted by the *VirtualHub* to function. To code a web site which controls Yoctopuce modules interactively, you must create a user interface which stores in a file or in a database the actions to be performed on the Yoctopuce modules. These actions are then read and run by the control script.

Common issues

For the HTTP callback API to work, the PHP option *allow_url_fopen* must be set. Some web site hosts do not set it by default. The problem then manifests itself with the following error:

```
error: URL file-access is disabled in the server configuration
```

To set this option, you must create, in the repertory where the control PHP script is located, an *.htaccess* file containing the following line:

```
php_flag "allow_url_fopen" "On"
```

Depending on the security policies of the host, it is sometimes impossible to authorize this option at the root of the web site, or even to install PHP scripts receiving data from a POST HTTP. In this case, place the PHP script in a subdirectory.

Limitations

This method that allows you to go through NAT filters cheaply has nevertheless a price. Communications being initiated by the *VirtualHub* at a more or less regular interval, reaction time to an event is clearly longer than if the Yoctopuce modules were driven directly. You can configure the reaction time in the specific window of the *VirtualHub*, but it is at least of a few seconds in the best case.

The *HTTP callback Yocto-API* mode is currently available in PHP and Node.JS only.

8.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

9. Using Yocto-Demo with C++

C++ is not the simplest language to master. However, if you take care to limit yourself to its essential functionalities, this language can very well be used for short programs quickly coded, and it has the advantage of being easily ported from one operating system to another. Under Windows, all the examples and the project models are tested with Microsoft Visual Studio 2010 Express, freely available on the Microsoft web site[1]. Under Mac OS X, all the examples and project models are tested with XCode 4, available on the App Store. Moreover, under Max OS X and under Linux, you can compile the examples using a command line with GCC using the provided `GNUmakefile`. In the same manner under Windows, a `Makefile` allows you to compile examples using a command line, fully knowing the compilation and linking arguments.

Yoctopuce C++ libraries[2] are integrally provided as source files. A section of the low-level library is written in pure C, but you should not need to interact directly with it: everything was done to ensure the simplest possible interaction from C++. The library is naturally also available as binary files, so that you can link it directly if you prefer.

You will soon notice that the C++ API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface. You will find in the last section of this chapter all the information needed to create a wholly new project linked with the Yoctopuce libraries.

9.1. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a C++ code snipplet to use the Led function.

```
#include "yocto_api.h"
#include "yocto_led.h"

[...]
String  errmsg;
YLed *led;

// Get access to your device, connected locally on USB for instance
yRegisterHub("usb", errmsg);
led = yFindLed("YCTOPOC1-123456.led");
```

1 http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-cpp-express
2 www.yoctopuce.com/EN/libraries.php

```
// Hot-plug is easy: just check that the device is online
if(led->isOnline())
{
    // Use led->set_power(), ...
}
```

Let's look at these lines in more details.

yocto_api.h et yocto_led.h

These two include files provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api.h` must always be used, `yocto_led.h` is necessary to manage modules containing a led, such as Yocto-Demo.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindLed

The `yFindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
YLed *led = yFindLed("YCTOPOC1-123456.led");
YLed *led = yFindLed("YCTOPOC1-123456.MyFunction");
YLed *led = yFindLed("MyModule.led");
YLed *led = yFindLed("MyModule.MyFunction");
YLed *led = yFindLed("MyFunction");
```

`yFindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `yFindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `yFindLed` allows you to turn on and off the led. The argument is Y_POWER_ON or Y_POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch your C++ environment and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library. If you prefer to work with your favorite text editor, open the file `main.cpp`, and type `make` to build the example when you are done.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
#include "yocto_api.h"
#include "yocto_led.h"
#include <iostream>
#include <stdlib.h>

using namespace std;
```

```
static void usage(void)
{
    cout << "usage: demo <serial_number>  [ on | off ]" << endl;
    cout << "       demo <logical_name> [ on | off ]" << endl;
    cout << "       demo any [ on | off ]                (use any discovered device)" <<
endl;
    u64 now = yGetTickCount();    // dirty active wait loop
        while (yGetTickCount()-now<3000);
    exit(1);
}

int main(int argc, const char * argv[])
{
    string errmsg;
    string target;
    YLed   *led;
    string on_off;

    if(argc < 3) {
        usage();
    }
    target     = (string) argv[1];
    on_off = (string) argv[2];

    // Setup the API to use local USB devices
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    if(target == "any"){
        led =  yFirstLed();
    }else{
        led =  yFindLed(target + ".led");
    }
    if (led && led->isOnline()) {
        led->set_power(on_off == "on" ? Y_POWER_ON : Y_POWER_OFF);
    } else {
        cout << "Module not connected (check identification and USB cable)" << endl;
    }

    return 0;
}
```

9.2. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#include <iostream>
#include <stdlib.h>

#include "yocto_api.h"

using namespace std;

static void usage(const char *exe)
{
    cout << "usage: " << exe << " <serial or logical name> [ON/OFF]" << endl;
    exit(1);
}


int main(int argc, const char * argv[])
{
    string      errmsg;

    // Setup the API to use local USB devices
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }
```

```
    if(argc < 2)
        usage(argv[0]);

    YModule *module = yFindModule(argv[1]);  // use serial or logical name

    if (module->isOnline()) {
        if (argc > 2) {
            if (string(argv[2]) == "ON")
                module->set_beacon(Y_BEACON_ON);
            else
                module->set_beacon(Y_BEACON_OFF);
        }
        cout << "serial:       " << module->get_serialNumber() << endl;
        cout << "logical name: " << module->get_logicalName() << endl;
        cout << "luminosity:   " << module->get_luminosity() << endl;
        cout << "beacon:       ";
        if (module->get_beacon()==Y_BEACON_ON)
           cout << "ON" << endl;
        else
           cout << "OFF" << endl;
        cout << "upTime:       " << module->get_upTime()/1000 << " sec" << endl;
        cout << "USB current:  " << module->get_usbCurrent() << " mA" << endl;
        cout << "Logs:"<< endl << module->get_lastLogs() << endl;
    } else {
        cout << argv[1] << " not connected (check identification and USB cable)"
             << endl;
    }
    return 0;
}
```

Each property xxx of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
#include <iostream>
#include <stdlib.h>

#include "yocto_api.h"

using namespace std;

static void usage(const char *exe)
{
    cerr << "usage: " << exe << " <serial> <newLogicalName>" << endl;
    exit(1);
}

int main(int argc, const char * argv[])
{
    string       errmsg;

    // Setup the API to use local USB devices
    if(yRegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    if(argc < 2)
        usage(argv[0]);

    YModule *module = yFindModule(argv[1]);  // use serial or logical name

    if (module->isOnline()) {
        if (argc >= 3){
```

```
            string newname =  argv[2];
            if (!yCheckLogicalName(newname)){
                cerr << "Invalid name (" << newname << ")" << endl;
                usage(argv[0]);
            }
            module->set_logicalName(newname);
            module->saveToFlash();
        }
        cout << "Current name: " << module->get_logicalName() << endl;
    } else {
        cout << argv[1] << " not connected (check identification and USB cable)"
             << endl;
    }
    return 0;
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
#include <iostream>

#include "yocto_api.h"

using namespace std;

int main(int argc, const char * argv[])
{
    string      errmsg;

    // Setup the API to use local USB devices
    if(YAPI::RegisterHub("usb", errmsg) != YAPI_SUCCESS) {
        cerr << "RegisterHub error: " << errmsg << endl;
        return 1;
    }

    cout << "Device list: " << endl;

    YModule *module = YModule::FirstModule();
    while (module != NULL) {
        cout << module->get_serialNumber() << " ";
        cout << module->get_productName()  << endl;
        module = module->nextModule();
    }
    return 0;
}
```

9.3. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run.

This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

9.4. Integration variants for the C++ Yoctopuce library

Depending on your needs and on your preferences, you can integrate the library into your projects in several distinct manners. This section explains how to implement the different options.

Integration in source format

Integrating all the sources of the library into your projects has several advantages:

- It guaranties the respect of the compilation conventions of your project (32/64 bits, inclusion of debugging symbols, unicode or ASCII characters, etc.);
- It facilitates debugging if you are looking for the cause of a problem linked to the Yoctopuce library;
- It reduces the dependencies on third party components, for example in the case where you would need to recompile this project for another architecture in many years;
- It does not require the installation of a dynamic library specific to Yoctopuce on the final system, everything is in the executable.

To integrate the source code, the easiest way is to simply include the `Sources` directory of your Yoctopuce library into your **IncludePath**, and to add all the files of this directory (including the sub-directory `yapi`) to your project.

For your project to build correctly, you need to link with your project the prerequisite system libraries, that is:

- For Windows: the libraries are added automatically
- For Mac OS X: **IOKit.framework** and **CoreFoundation.framework**
- For Linux: **libm**, **libpthread**, **libusb1.0**, and **libstdc++**

Integration as a static library

Integration of the Yoctopuce library as a static library is a simpler manner to build a small executable which uses Yoctopuce modules. You can quickly compile the program with a single command. You do not need to install a dynamic library specific to Yoctopuce, everything is in the executable.

To integrate the static Yoctopuce library to your project, you must include the `Sources` directory of the Yoctopuce library into your **IncludePath**, and add the sub-directory `Binaries/...` corresponding to your operating system into your **libPath**.

Then, for you project to build correctly, you need to link with your project the Yoctopuce library and the prerequisite system libraries:

- For Windows: **yocto-static.lib**
- For Mac OS X: **libyocto-static.a**, **IOKit.framework**, and **CoreFoundation.framework**
- For Linux: **libyocto-static.a**, **libm**, **libpthread**, **libusb1.0**, and **libstdc++**.

Note, under Linux, if you wish to compile in command line with GCC, it is generally advisable to link system libraries as dynamic libraries, rather than as static ones. To mix static and dynamic libraries on the same command line, you must pass the following arguments:

```
gcc (...) -Wl,-Bstatic -lyocto-static -Wl,-Bdynamic -lm -lpthread -lusb-1.0 -lstdc++
```

Integration as a dynamic library

Integration of the Yoctopuce library as a dynamic library allows you to produce an executable smaller than with the two previous methods, and to possibly update this library, if a patch reveals itself necessary, without needing to recompile the source code of the application. On the other hand, it is an integration mode which systematically requires you to copy the dynamic library on the target machine where the application will run (**yocto.dll** for Windows, **libyocto.so.1.0.1** for Mac OS X and Linux).

To integrate the dynamic Yoctopuce library to your project, you must include the `Sources` directory of the Yoctopuce library into your **IncludePath**, and add the sub-directory `Binaries/...` corresponding to your operating system into your **LibPath**.

Then, for you project to build correctly, you need to link with your project the dynamic Yoctopuce library and the prerequisite system libraries:

- For Windows: **yocto.lib**
- For Mac OS X: **libyocto**, **IOKit.framework**, and **CoreFoundation.framework**
- For Linux: **libyocto**, **libm**, **libpthread**, **libusb1.0**, and **libstdc++**.

With GCC, the command line to compile is simply:

```
gcc (...) -lyocto -lm -lpthread -lusb-1.0 -lstdc++
```

10. Using Yocto-Demo with Objective-C

Objective-C is language of choice for programming on Mac OS X, due to its integration with the Cocoa framework. In order to use the Objective-C library, you need XCode version 4.2 (earlier versions will not work), available freely when you run Lion. If you are still under Snow Leopard, you need to be registered as Apple developer to be able to download XCode 4.2. The Yoctopuce library is ARC compatible. You can therefore implement your projects either using the traditional *retain / release* method, or using the *Automatic Reference Counting*.

Yoctopuce Objective-C libraries[1] are integrally provided as source files. A section of the low-level library is written in pure C, but you should not need to interact directly with it: everything was done to ensure the simplest possible interaction from Objective-C.

You will soon notice that the Objective-C API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface. You can find on Yoctopuce blog a detailed example[2] with video shots showing how to integrate the library into your projects.

10.1. Control of the Led function

Launch Xcode 4.2 and open the corresponding sample project provided in the directory **Examples/ Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"
#import "yocto_led.h"


static void usage(void)
{
    NSLog(@"usage: demo <serial_number>  [ on | off ]");
    NSLog(@"       demo <logical_name> [ on | off ]");
    NSLog(@"       demo any [ on | off ]                (use any discovered device)");
    exit(1);
}
```

[1] www.yoctopuce.com/EN/libraries.php
[2] www.yoctopuce.com/EN/article/new-objective-c-library-for-mac-os-x

```
int main(int argc, const char * argv[])
{
    NSError *error;
    if(argc < 3) {
        usage();
    }

    @autoreleasepool {
        NSString *target = [NSString stringWithUTF8String:argv[1]];
        NSString *on_off = [NSString stringWithUTF8String:argv[2]];
        YLed     *led;

        if([YAPI RegisterHub:@"usb": &error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }
        if([target isEqualToString:@"any"]){
            led =  [YLed FirstLed];
        }else{
            led =  [YLed FindLed:[target stringByAppendingString:@".led"]];
        }
        if ([led isOnline]) {
            if ([on_off isEqualToString:@"on"])
                [led set_power:Y_POWER_ON];
            else
                [led set_power:Y_POWER_OFF];
        } else {
            NSLog(@"Module not connected (check identification and USB cable)\n");
        }
    }
    return 0;
}
```

There are only a few really important lines in this example. We will look at them in details.

yocto_api.h et yocto_led.h

These two import files provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api.h` must always be used, `yocto_led.h` is necessary to manage modules containing a led, such as Yocto-Demo.

[YAPI RegisterHub]

The `[YAPI RegisterHub]` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `@"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

[Led FindLed]

The `[Led FindLed]` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
YLed *led = [Led FindLed:@"YCTOPOC1-123456.led"];
YLed *led = [Led FindLed:@"YCTOPOC1-123456.MyFunction"];
YLed *led = [Led FindLed:@"MyModule.led"];
YLed *led = [Led FindLed:@"MyModule.MyFunction"];
YLed *led = [Led FindLed:@"MyFunction"];
```

`[Led FindLed]` returns an object which you can then use at will to control the led.

isOnline

The `isOnline` method of the object returned by `[Led FindLed]` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `YLed.FindLed` allows you to turn on and off the led. The argument is YLed.POWER_ON or YLed.POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

10.2. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"

static void usage(const char *exe)
{
    NSLog(@"usage: %s <serial or logical name> [ON/OFF]\n",exe);
    exit(1);
}


int main (int argc, const char * argv[])
{
    NSError *error;

    @autoreleasepool {
        // Setup the API to use local USB devices
        if([YAPI RegisterHub:@"usb": &error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }
        if(argc < 2)
            usage(argv[0]);
        NSString *serial_or_name =[NSString stringWithUTF8String:argv[1]];
        // use serial or logical name
        YModule *module = [YModule FindModule:serial_or_name];
        if ([module isOnline]) {
            if (argc > 2) {
                if (strcmp(argv[2], "ON")==0)
                    [module setBeacon:Y_BEACON_ON];
                else
                    [module setBeacon:Y_BEACON_OFF];
            }
            NSLog(@"serial:       %@\n", [module serialNumber]);
            NSLog(@"logical name: %@\n", [module logicalName]);
            NSLog(@"luminosity:   %d\n", [module luminosity]);
            NSLog(@"beacon:       ");
            if ([module beacon] == Y_BEACON_ON)
               NSLog(@"ON\n");
            else
               NSLog(@"OFF\n");
            NSLog(@"upTime:       %ld sec\n", [module upTime]/1000);
            NSLog(@"USB current:  %d mA\n",  [module usbCurrent]);
            NSLog(@"logs:  %@\n",  [module get_lastLogs]);
        } else {
            NSLog(@"%@ not connected (check identification and USB cable)\n",
                serial_or_name);
        }
    }
    return 0;
}
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx`, and properties which are not read-only can be modified with the help of the `set_xxx:` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx:` function. However, this modification is performed only in the random access memory

(RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash` method. The short example below allows you to modify the logical name of a module.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"

static void usage(const char *exe)
{
    NSLog(@"usage: %s <serial> <newLogicalName>\n",exe);
    exit(1);
}


int main (int argc, const char * argv[])
{
    NSError *error;

    @autoreleasepool {
        // Setup the API to use local USB devices
        if([YAPI RegisterHub:@"usb" :&error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@", [error localizedDescription]);
            return 1;
        }

        if(argc < 2)
            usage(argv[0]);

        NSString *serial_or_name =[NSString stringWithUTF8String:argv[1]];
        // use serial or logical name
        YModule *module = [YModule FindModule:serial_or_name];

        if (module.isOnline) {
            if (argc >= 3){
                NSString *newname =  [NSString stringWithUTF8String:argv[2]];
                if (![YAPI CheckLogicalName:newname]){
                    NSLog(@"Invalid name (%@)\n", newname);
                    usage(argv[0]);
                }
                module.logicalName = newname;
                [module saveToFlash];
            }
            NSLog(@"Current name: %@\n", module.logicalName);
        } else {
            NSLog(@"%@ not connected (check identification and USB cable)\n",
                serial_or_name);
        }
    }
    return 0;
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `NULL`. Below a short example listing the connected modules.

```
#import <Foundation/Foundation.h>
#import "yocto_api.h"

int main (int argc, const char * argv[])
{
    NSError *error;
```

```
    @autoreleasepool {
        // Setup the API to use local USB devices
        if([YAPI RegisterHub:@"usb" :&error] != YAPI_SUCCESS) {
            NSLog(@"RegisterHub error: %@\n", [error localizedDescription]);
            return 1;
        }

        NSLog(@"Device list:\n");

        YModule *module = [YModule FirstModule];
        while (module != nil) {
            NSLog(@"%@ %@",module.serialNumber, module.productName);
            module = [module nextModule];
        }
    }
    return 0;
}
```

10.3. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

11. Using Yocto-Demo with Visual Basic .NET

VisualBasic has long been the most favored entrance path to the Microsoft world. Therefore, we had to provide our library for this language, even if the new trend is shifting to C#. All the examples and the project models are tested with Microsoft VisualBasic 2010 Express, freely available on the Microsoft web site[1].

11.1. Installation

Download the Visual Basic Yoctopuce library from the Yoctopuce web site[2]. There is no setup program, simply copy the content of the zip file into the directory of your choice. You mostly need the content of the `Sources` directory. The other directories contain the documentation and a few sample programs. All sample projects are Visual Basic 2010, projects, if you are using a previous version, you may have to recreate the projects structure from scratch.

11.2. Using the Yoctopuce API in a Visual Basic project

The Visual Basic.NET Yoctopuce library is composed of a DLL and of source files in Visual Basic. The DLL is not a .NET DLL, but a classic DLL, written in C, which manages the low level communications with the modules[3]. The source files in Visual Basic manage the high level part of the API. Therefore, your need both this DLL and the .vb files of the `sources` directory to create a project managing Yoctopuce modules.

Configuring a Visual Basic project

The following indications are provided for Visual Studio Express 2010, but the process is similar for other versions. Start by creating your project. Then, on the *Solution Explorer* panel, right click on your project, and select "Add" and then "Add an existing item".

A file selection window opens. Select the `yocto_api.vb` file and the files corresponding to the functions of the Yoctopuce modules that your project is going to manage. If in doubt, select all the files.

You then have the choice between simply adding these files to your project, or to add them as links (the **Add** button is in fact a scroll-down menu). In the first case, Visual Studio copies the selected files into your project. In the second case, Visual Studio simply keeps a link on the original files. We recommend you to use links, which makes updates of the library much easier.

1 http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-basic-express
2 www.yoctopuce.com/EN/libraries.php
3 The sources of this DLL are available in the C++ API

Then add in the same manner the `yapi.dll` DLL, located in the `Sources/dll` directory[4]. Then, from the **Solution Explorer** window, right click on the DLL, select **Properties** and in the **Properties** panel, set the **Copy to output folder** to **always**. You are now ready to use your Yoctopuce modules from Visual Studio.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

11.3. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a Visual Basic code snipplet to use the Led function.

```
[...]
Dim errmsg As String errmsg
Dim led As YLed

REM Get access to your device, connected locally on USB for instance
yRegisterHub("usb", errmsg)
led = yFindLed("YCTOPOC1-123456.led")

REM Hot-plug is easy: just check that the device is online
If (led.isOnline()) Then
   REM Use led.set_power(), ...
End If
```

Let's look at these lines in more details.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindLed

The `yFindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led = yFindLed("YCTOPOC1-123456.led")
led = yFindLed("YCTOPOC1-123456.MyFunction")
led = yFindLed("MyModule.led")
led = yFindLed("MyModule.MyFunction")
led = yFindLed("MyFunction")
```

`yFindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `yFindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `yFindLed` allows you to turn on and off the led. The argument is Y_POWER_ON or Y_POWER_OFF. In the reference on the programming

[4] Remember to change the filter of the selection window, otherwise the DLL will not show.

interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch Microsoft VisualBasic and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
Module Module1

    Private Sub Usage()
        Dim execname = System.AppDomain.CurrentDomain.FriendlyName
        Console.WriteLine("Usage:")
        Console.WriteLine(execname+" <serial_number>  [ on | off ]")
        Console.WriteLine(execname+" <logical_name> [ on | off ]")
        Console.WriteLine(execname+" any [ on | off ] ")
        System.Threading.Thread.Sleep(2500)

        End
    End Sub

    Sub Main()
        Dim argv() As String = System.Environment.GetCommandLineArgs()
        Dim errmsg As String = ""
        Dim target As String
        Dim led As YLed

        Dim on_off As String


        If argv.Length < 3 Then Usage()

        target = argv(1)
        on_off = argv(2).ToUpper()


        REM Setup the API to use local USB devices
        If (yRegisterHub("usb", errmsg) <> YAPI_SUCCESS) Then
            Console.WriteLine("RegisterHub error: " + errmsg)
            End
        End If

        If target = "any" Then
            led = yFirstLed()
            If led Is Nothing Then
                Console.WriteLine("No module connected (check USB cable) ")
                End
            End If

        Else
            led = yFindLed(target + ".led")

        End If

        If (led.isOnline()) Then
            If on_off = "ON" Then led.set_power(Y_POWER_ON) Else led.set_power(Y_POWER_OFF)
        Else
            Console.WriteLine("Module not connected (check identification and USB cable)")
        End If
    End Sub

End Module
```

11.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
Imports System.IO
Imports System.Environment

Module Module1

  Sub usage()
    Console.WriteLine("usage: demo <serial or logical name> [ON/OFF]")
    End
  End Sub

  Sub Main()
    Dim argv() As String = System.Environment.GetCommandLineArgs()
    Dim errmsg As String = ""
    Dim m As ymodule

    If (yRegisterHub("usb", errmsg) <> YAPI_SUCCESS) Then
      Console.WriteLine("RegisterHub error:" + errmsg)
      End
    End If

    If argv.Length < 2 Then usage()

    m = yFindModule(argv(1)) REM use serial or logical name

    If (m.isOnline()) Then
      If argv.Length > 2 Then
        If argv(2) = "ON" Then m.set_beacon(Y_BEACON_ON)
        If argv(2) = "OFF" Then m.set_beacon(Y_BEACON_OFF)
      End If
      Console.WriteLine("serial:       " + m.get_serialNumber())
      Console.WriteLine("logical name: " + m.get_logicalName())
      Console.WriteLine("luminosity:   " + Str(m.get_luminosity()))
      Console.Write("beacon:       ")
      If (m.get_beacon() = Y_BEACON_ON) Then
        Console.WriteLine("ON")
      Else
        Console.WriteLine("OFF")
      End If
      Console.WriteLine("upTime:       " + Str(m.get_upTime() / 1000) + " sec")
      Console.WriteLine("USB current:  " + Str(m.get_usbCurrent()) + " mA")
      Console.WriteLine("Logs:")
      Console.WriteLine(m.get_lastLogs())
    Else
      Console.WriteLine(argv(1) + " not connected (check identification and USB cable)")
    End If



  End Sub

End Module
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
Module Module1


  Sub usage()

    Console.WriteLine("usage: demo <serial or logical name> <new logical name>")
    End
```

```
  End Sub

  Sub Main()
    Dim argv() As String = System.Environment.GetCommandLineArgs()
    Dim errmsg As String = ""
    Dim newname As String
    Dim m As YModule

    If (argv.Length <> 3) Then usage()

    REM Setup the API to use local USB devices
    If yRegisterHub("usb", errmsg) <> YAPI_SUCCESS Then
      Console.WriteLine("RegisterHub error: " + errmsg)
      End
    End If

    m = yFindModule(argv(1)) REM use serial or logical name
    If m.isOnline() Then

      newname = argv(2)
      If (Not yCheckLogicalName(newname)) Then
        Console.WriteLine("Invalid name (" + newname + ")")
        End
      End If
      m.set_logicalName(newname)
      m.saveToFlash() REM do not forget this

      Console.Write("Module: serial= " + m.get_serialNumber)
      Console.Write(" / name= " + m.get_logicalName())
    Else
      Console.Write("not connected (check identification and USB cable")
    End If

  End Sub

End Module
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `Nothing`. Below a short example listing the connected modules.

```
Module Module1

  Sub Main()
    Dim M As ymodule
    Dim errmsg As String = ""

    REM Setup the API to use local USB devices
    If yRegisterHub("usb", errmsg) <> YAPI_SUCCESS Then
      Console.WriteLine("RegisterHub error: " + errmsg)
      End
    End If

    Console.WriteLine("Device list")
    M = yFirstModule()
    While M IsNot Nothing
      Console.WriteLine(M.get_serialNumber() + " (" + M.get_productName() + ")")
      M = M.nextModule()
    End While

  End Sub

    End Module
```

11.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

12. Using Yocto-Demo with C#

C# (pronounced C-Sharp) is an object-oriented programming language promoted by Microsoft, it is somewhat similar to Java. Like Visual-Basic and Delphi, it allows you to create Windows applications quite easily. All the examples and the project models are tested with Microsoft C# 2010 Express, freely available on the Microsoft web site[1].

12.1. Installation

Download the Visual C# Yoctopuce library from the Yoctopuce web site[2]. There is no setup program, simply copy the content of the zip file into the directory of your choice. You mostly need the content of the `Sources` directory. The other directories contain the documentation and a few sample programs. All sample projects are Visual C# 2010, projects, if you are using a previous version, you may have to recreate the projects structure from scratch.

12.2. Using the Yoctopuce API in a Visual C# project

The Visual C#.NET Yoctopuce library is composed of a DLL and of source files in Visual C#. The DLL is not a .NET DLL, but a classic DLL, written in C, which manages the low level communications with the modules[3]. The source files in Visual C# manage the high level part of the API. Therefore, your need both this DLL and the .cs files of the `sources` directory to create a project managing Yoctopuce modules.

Configuring a Visual C# project

The following indications are provided for Visual Studio Express 2010, but the process is similar for other versions. Start by creating your project. Then, on the *Solution Explorer* panel, right click on your project, and select "Add" and then "Add an existing item".

A file selection window opens. Select the `yocto_api.cs` file and the files corresponding to the functions of the Yoctopuce modules that your project is going to manage. If in doubt, select all the files.

You then have the choice between simply adding these files to your project, or to add them as links (the **Add** button is in fact a scroll-down menu). In the first case, Visual Studio copies the selected files into your project. In the second case, Visual Studio simply keeps a link on the original files. We recommend you to use links, which makes updates of the library much easier.

1 http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-csharp-express
2 www.yoctopuce.com/EN/libraries.php
3 The sources of this DLL are available in the C++ API

Then add in the same manner the `yapi.dll` DLL, located in the `Sources/dll` directory[4]. Then, from the **Solution Explorer** window, right click on the DLL, select **Properties** and in the **Properties** panel, set the **Copy to output folder** to **always**. You are now ready to use your Yoctopuce modules from Visual Studio.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

12.3. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a C# code snipplet to use the Led function.

```
[...]
string errmsg ="";
YLed led;

// Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("usb", errmsg);
led = YLed.FindLed("YCTOPOC1-123456.led");

// Hot-plug is easy: just check that the device is online
if (led.isOnline())
 {  // Use led.set_power(); ...
 }
```

Let's look at these lines in more details.

YAPI.RegisterHub

The `YAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI.SUCCESS` and `errmsg` contains the error message.

YLed.FindLed

The `YLed.FindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led = YLed.FindLed("YCTOPOC1-123456.led");
led = YLed.FindLed("YCTOPOC1-123456.MyFunction");
led = YLed.FindLed("MyModule.led");
led = YLed.FindLed("MyModule.MyFunction");
led = YLed.FindLed("MyFunction");
```

`YLed.FindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `YLed.FindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `YLed.FindLed` allows you to turn on and off the led. The argument is YLed.POWER_ON or YLed.POWER_OFF. In the reference on the

[4] Remember to change the filter of the selection window, otherwise the DLL will not show.

programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch Microsoft Visual C# and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    {
      string  execname  = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine(execname+" <serial_number>  [ on | off ]");
      Console.WriteLine(execname+" <logical_name> [ on | off ]");
      Console.WriteLine(execname+" any [ on | off ] ");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      string errmsg = "";
      string target;
      YLed led;
      string on_off;

      if (args.Length < 2) usage();
      target = args[0].ToUpper();
      on_off = args[1].ToUpper();

      if (YAPI.RegisterHub("usb", ref errmsg) != YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      if (target == "ANY")
      {
        led = YLed.FirstLed();
        if (led == null)
        {
          Console.WriteLine("No module connected (check USB cable) ");
          Environment.Exit(0);
        }
      }
      else led = YLed.FindLed(target + ".led");

      if (led.isOnline())
      {
        if (on_off == "ON") led.set_power(YLed.POWER_ON); else led.set_power(YLed.POWER_OFF
);
      }
      else Console.WriteLine("Module not connected (check identification and USB cable)");
    }
  }
}
```

12.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;


namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    { string execname = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine("Usage:");
      Console.WriteLine(execname+" <serial or logical name> [ON/OFF]");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }


      if (args.Length < 1)  usage();

      m = YModule.FindModule(args[0]); // use serial or logical name

      if (m.isOnline())
      {
        if (args.Length >= 2)
        {
          if (args[1].ToUpper() == "ON") { m.set_beacon(YModule.BEACON_ON); }
          if (args[1].ToUpper() == "OFF") { m.set_beacon(YModule.BEACON_OFF); }
        }

        Console.WriteLine("serial:       " + m.get_serialNumber());
        Console.WriteLine("logical name: " + m.get_logicalName());
        Console.WriteLine("luminosity:   " + m.get_luminosity().ToString());
        Console.Write("beacon:       ");
        if (m.get_beacon() == YModule.BEACON_ON)
          Console.WriteLine("ON");
        else
          Console.WriteLine("OFF");
        Console.WriteLine("upTime:       " + (m.get_upTime() / 1000 ).ToString()+ " sec");
        Console.WriteLine("USB current:  " + m.get_usbCurrent().ToString() + " mA");
        Console.WriteLine("Logs:\r\n"+ m.get_lastLogs());

      }
      else
        Console.WriteLine(args[0] + " not connected (check identification and USB cable)");

    }
  }
}
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;

namespace ConsoleApplication1
{
  class Program
  {
    static void usage()
    { string execname = System.AppDomain.CurrentDomain.FriendlyName;
      Console.WriteLine("Usage:");
      Console.WriteLine("usage: demo <serial or logical name> <new logical name>");
      System.Threading.Thread.Sleep(2500);
      Environment.Exit(0);
    }

    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";
      string newname;

      if (args.Length != 2) usage();

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      m = YModule.FindModule(args[0]); // use serial or logical name

      if (m.isOnline())
      {
        newname = args[1];
        if (!YAPI.CheckLogicalName(newname))
        {
          Console.WriteLine("Invalid name (" + newname + ")");
          Environment.Exit(0);
        }

        m.set_logicalName(newname);
        m.saveToFlash(); // do not forget this

        Console.Write("Module: serial= " + m.get_serialNumber());
        Console.WriteLine(" / name= " + m.get_logicalName());
      }
      else
        Console.Write("not connected (check identification and USB cable");
    }
  }
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
using System;
using System.Collections.Generic;
using System.Linq;
```

```
using System.Text;

namespace ConsoleApplication1
{
  class Program
  {
    static void Main(string[] args)
    {
      YModule m;
      string errmsg = "";

      if (YAPI.RegisterHub("usb", ref errmsg) !=  YAPI.SUCCESS)
      {
        Console.WriteLine("RegisterHub error: " + errmsg);
        Environment.Exit(0);
      }

      Console.WriteLine("Device list");
      m = YModule.FirstModule();
      while (m!=null)
      { Console.WriteLine(m.get_serialNumber() + " (" + m.get_productName() + ")");
       m = m.nextModule();
      }

    }
  }
}
```

12.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

13. Using Yocto-Demo with Delphi

Delphi is a descendent of Turbo-Pascal. Originally, Delphi was produced by Borland, Embarcadero now edits it. The strength of this language resides in its ease of use, as anyone with some notions of the Pascal language can develop a Windows application in next to no time. Its only disadvantage is to cost something[1].

Delphi libraries are provided not as VCL components, but directly as source files. These files are compatible with most Delphi versions.[2]

To keep them simple, all the examples provided in this documentation are console applications. Obviously, the libraries work in a strictly identical way with VCL applications.

You will soon notice that the Delphi API defines many functions which return objects. You do not need to deallocate these objects yourself, the API does it automatically at the end of the application.

13.1. Preparation

Go to the Yoctopuce web site and download the Yoctopuce Delphi libraries[3]. Uncompress everything in a directory of your choice, add the subdirectory *sources* in the list of directories of Delphi libraries.[4]

By default, the Yoctopuce Delphi library uses the *yapi.dll* DLL, all the applications you will create with Delphi must have access to this DLL. The simplest way to ensure this is to make sure *yapi.dll* is located in the same directory as the executable file of your application.

13.2. Control of the Led function

Launch your Delphi environment, copy the yapi.dll DLL in a directory, create a new console application in the same directory, and copy-paste the piece of code below:

```
program helloworld;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api,
  yocto_led;
```

[1] Actually, Borland provided free versions (for personal use) of Delphi 2006 and 2007. Look for them on the Internet, you may still be able to download them.
[2] Delphi libraries are regularly tested with Delphi 5 and Delphi XE2.
[3] www.yoctopuce.com/EN/libraries.php
[4] Use the **Tools / Environment options** menu.

```
Procedure  Usage();
  var
   exe : string;

  begin
    exe:= ExtractFileName(paramstr(0));
    WriteLn(exe+' <serial_number>');
    WriteLn(exe+' <logical_name>');
    WriteLn(exe+' any');
    halt;
  End;

procedure setLedState(led:TYLed; state:boolean);
  begin
    if (led.isOnline()) then
     begin
      if state then led.set_power(Y_POWER_ON)
               else led.set_power(Y_POWER_OFF);
     end
    else Writeln('Module not connected (check identification and USB cable)');
  end;

var
  c         : char;
  led       : TYLed;
  errmsg    : string;

begin

  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  if paramstr(1)='any' then
    begin
      // use the first available led
      led := yFirstLed();
      if led=nil then
         begin
           writeln('No module connected (check USB cable)');
           halt;
         end
       end
   else // or use the one specified on the command line
    led:= YFindLed(paramstr(1)+'.led');

  // make sure it is connected
  if not(led.isOnline()) then
     begin
        Writeln('Module not connected (check identification and USB cable)');
       halt;
     end;

  // minimalist UI
  Writeln('0: turn test led OFF');
  Writeln('1: turn test led ON');
  Writeln('x: exit');
  repeat
    read(c);
    case c  of
      '0' : setLedState(led,false);
      '1' : setLedState(led,true);
    end;
  until c='x';

end.
```

There are only a few really important lines in this sample example. We will look at them in details.

yocto_api and yocto_led

These two units provide access to the functions allowing you to manage Yoctopuce modules. `yocto_api` must always be used, `yocto_led` is necessary to manage modules containing a led, such as Yocto-Demo.

yRegisterHub

The `yRegisterHub` function initializes the Yoctopuce API and specifies where the modules should be looked for. When used with the parameter `'usb'`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI_SUCCESS` and `errmsg` contains the error message.

yFindLed

The `yFindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can also use logical names, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led := yFindLed("YCTOPOC1-123456.led");
led := yFindLed("YCTOPOC1-123456.MyFunction");
led := yFindLed("MyModule.led");
led := yFindLed("MyModule.MyFunction");
led := yFindLed("MyFunction");
```

`yFindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `yFindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `yFindLed` allows you to turn on and off the led. The argument is Y_POWER_ON or Y_POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

13.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
program modulecontrol;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

const
  serial = 'YCTOPOC1-123456'; // use serial number or logical name

procedure refresh(module:Tymodule) ;
  begin
    if (module.isOnline())  then
     begin
       Writeln('');
       Writeln('Serial       : ' + module.get_serialNumber());
       Writeln('Logical name : ' + module.get_logicalName());
       Writeln('Luminosity   : ' + intToStr(module.get_luminosity()));
       Write('Beacon    :');
       if  (module.get_beacon()=Y_BEACON_ON) then Writeln('on')
                                             else Writeln('off');
       Writeln('uptime       : ' + intToStr(module.get_upTime() div 1000)+'s');
       Writeln('USB current  : ' + intToStr(module.get_usbCurrent())+'mA');
       Writeln('Logs         : ');
       Writeln(module.get_lastlogs());
       Writeln('');
       Writeln('r : refresh / b:beacon ON / space : beacon off');
     end
    else Writeln('Module not connected (check identification and USB cable)');
  end;
```

```
procedure beacon(module:Tymodule;state:integer);
  begin
    module.set_beacon(state);
    refresh(module);
  end;

var
  module : TYModule;
  c      : char;
  errmsg : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  module := yFindModule(serial);
  refresh(module);

  repeat
    read(c);
    case c of
     'r': refresh(module);
     'b': beacon(module,Y_BEACON_ON);
     ' ': beacon(module,Y_BEACON_OFF);
    end;
  until  c = 'x';
end.
```

Each property `xxx` of the module can be read thanks to a method of type `get_xxxx()`, and properties which are not read-only can be modified with the help of the `set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
program savesettings;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

const
  serial = 'YCTOPOC1-123456'; // use serial number or logical name

var
  module  : TYModule;
  errmsg  : string;
  newname : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  module := yFindModule(serial);
  if (not(module.isOnline)) then
   begin
     writeln('Module not connected (check identification and USB cable)');
     exit;
```

```
    end;

  Writeln('Current logical name : '+module.get_logicalName());
  Write('Enter new name : ');
  Readln(newname);
  if (not(yCheckLogicalName(newname))) then
    begin
      Writeln('invalid logical name');
      exit;
    end;
  module.set_logicalName(newname);
  module.saveToFlash();

  Writeln('logical name is now : '+module.get_logicalName());
end.
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `nil`. Below a short example listing the connected modules.

```
program inventory;
{$APPTYPE CONSOLE}
uses
  SysUtils,
  yocto_api;

var
  module : TYModule;
  errmsg : string;

begin
  // Setup the API to use local USB devices
  if yRegisterHub('usb', errmsg)<>YAPI_SUCCESS then
  begin
    Write('RegisterHub error: '+errmsg);
    exit;
  end;

  Writeln('Device list');

  module := yFirstModule();
  while module<>nil  do
   begin
     Writeln( module.get_serialNumber()+' ('+module.get_productName()+')');
     module := module.nextModule();
   end;

end.
```

13.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run.

This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

14. Using the Yocto-Demo with Python

Python is an interpreted object oriented language developed by Guido van Rossum. Among its advantages is the fact that it is free, and the fact that it is available for most platforms, Windows as well as UNIX. It is an ideal language to write small scripts on a napkin. The Yoctopuce library is compatible with Python 2.6+ and 3+. It works under Windows, Mac OS X, and Linux, Intel as well as ARM. The library was tested with Python 2.6 and Python 3.2. Python interpreters are available on the Python web site[1].

14.1. Source files

The Yoctopuce library classes[2] for Python that you will use are provided as source files. Copy all the content of the *Sources* directory in the directory of your choice and add this directory to the *PYTHONPATH* environment variable. If you use an IDE to program in Python, refer to its documentation to configure it so that it automatically finds the API source files.

14.2. Dynamic library

A section of the low-level library is written in C, but you should not need to interact directly with it: it is provided as a DLL under Windows, as a *.so* files under UNIX, and as a *.dylib* file under Mac OS X. Everything was done to ensure the simplest possible interaction from Python: the distinct versions of the dynamic library corresponding to the distinct operating systems and architectures are stored in the *cdll* directory. The API automatically loads the correct file during its initialization. You should not have to worry about it.

If you ever need to recompile the dynamic library, its complete source code is located in the Yoctopuce C++ library.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

14.3. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a Python code snipplet to use the Led function.

[1] http://www.python.org/download/
[2] www.yoctopuce.com/EN/libraries.php

```
[...]

errmsg=YRefParam()
#Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("usb",errmsg)
led = YLed.FindLed("YCTOPOC1-123456.led")

# Hot-plug is easy: just check that the device is online
if led.isOnline():
    #Use led.set_power()
    ...

[...]
```

Let's look at these lines in more details.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. When used with the parameter `"usb"`, it will use the modules locally connected to the computer running the library. If the initialization does not succeed, this function returns a value different from `YAPI.SUCCESS` and `errmsg` contains the error message.

YLed.FindLed

The `YLed.FindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led = YLed.FindLed("YCTOPOC1-123456.led")
led = YLed.FindLed("YCTOPOC1-123456.MyFunction")
led = YLed.FindLed("MyModule.led")
led = YLed.FindLed("MyModule.MyFunction")
led = YLed.FindLed("MyFunction")
```

`YLed.FindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `YLed.FindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `YLed.FindLed` allows you to turn on and off the led. The argument is YLed.POWER_ON or YLed.POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch Python and open the corresponding sample script provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all side materials needed to make it work nicely as a small demo.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *
from yocto_led import *

def usage():
    scriptname = os.path.basename(sys.argv[0])
    print("Usage:")
```

```
    print(scriptname+' <serial_number>')
    print(scriptname+' <logical_name>')
    print(scriptname+' any  ')
    sys.exit()

def die(msg):
    sys.exit(msg+' (check USB cable)')

def setLedState(led,state):
    if led.isOnline():
        if state :
            led.set_power(YLed.POWER_ON)
        else:
            led.set_power(YLed.POWER_OFF)
    else:
       print('Module not connected (check identification and USB cable)')

errmsg=YRefParam()

if len(sys.argv)<2 :  usage()

target=sys.argv[1]

# Setup the API to use local USB devices
if YAPI.RegisterHub("usb", errmsg)!= YAPI.SUCCESS:
    sys.exit("init error"+errmsg.value)


if target=='any':
    # retreive any RGB led
    led = YLed.FirstLed()
    if led is None :
        die('No module connected')
else:
    led= YLed.FindLed(target + '.led')

if not(led.isOnline()):die('device not connected')

print('0: turn test led OFF')
print('1: turn test led ON')
print('x: exit')

try: input = raw_input  # python 2.x fix
except: pass

c= input("command:")

while c!='x':
    if c=='0' :  setLedState(led,False);
    elif c=='1' :setLedState(led,True);
    c= input("command:")
```

14.4. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *


def usage():
    sys.exit("usage: demo <serial or logical name> [ON/OFF]")

errmsg =YRefParam()
if YAPI.RegisterHub("usb", errmsg) !=  YAPI.SUCCESS:
    sys.exit("RegisterHub error: " + str(errmsg))

if len(sys.argv)<2 : usage()

m = YModule.FindModule(sys.argv[1]) ## use serial or logical name
```

```
if m.isOnline():
    if len(sys.argv) > 2:
        if sys.argv[2].upper() == "ON" :  m.set_beacon(YModule.BEACON_ON)
        if sys.argv[2].upper() == "OFF" : m.set_beacon(YModule.BEACON_OFF)

    print("serial:       " + m.get_serialNumber())
    print("logical name: " + m.get_logicalName())
    print("luminosity:   " + str(m.get_luminosity()))
    if m.get_beacon() == YModule.BEACON_ON:
        print("beacon:       ON")
    else:
        print("beacon:       OFF")
    print("upTime:       " + str(m.get_upTime()/1000)+" sec")
    print("USB current:  " + str(m.get_usbCurrent())+" mA")
    print("logs:\n" + m.get_lastLogs())
else:
    print(sys.argv[1] + " not connected (check identification and USB cable)")
```

Each property `xxx` of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys
from yocto_api import *

def usage():
    sys.exit("usage: demo <serial or logical name> <new logical name>")

if len(sys.argv) != 3 :  usage()

errmsg =YRefParam()
if YAPI.RegisterHub("usb", errmsg) !=  YAPI.SUCCESS:
    sys.exit("RegisterHub error: " + str(errmsg))

m = YModule.FindModule(sys.argv[1]) # use serial or logical name

if m.isOnline():
    newname = sys.argv[2]
    if not YAPI.CheckLogicalName(newname):
        sys.exit("Invalid name (" + newname + ")")
    m.set_logicalName(newname)
    m.saveToFlash()   # do not forget this
    print ("Module: serial= " + m.get_serialNumber()+" / name= " + m.get_logicalName())
else:
    sys.exit("not connected (check identification and USB cable")
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
#!/usr/bin/python
# -*- coding: utf-8 -*-
import os,sys

from yocto_api import *

errmsg=YRefParam()

# Setup the API to use local USB devices
if YAPI.RegisterHub("usb", errmsg)!= YAPI.SUCCESS:
    sys.exit("init error"+str(errmsg))

print('Device list')

module = YModule.FirstModule()
while module is not None:
     print(module.get_serialNumber()+' ('+module.get_productName()+')')
     module = module.nextModule()
```

14.5. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software. The only way to prevent this is to implement one of the two error handling techniques described below.

The method recommended by most programming languages for unpredictable error handling is the use of exceptions. By default, it is the behavior of the Yoctopuce library. If an error happens while you try to access a module, the library throws an exception. In this case, there are three possibilities:

- If your code catches the exception and handles it, everything goes well.
- If your program is running in debug mode, you can relatively easily determine where the problem happened and view the explanatory message linked to the exception.
- Otherwise... the exception makes your program crash, bang!

As this latest situation is not the most desirable, the Yoctopuce library offers another possibility for error handling, allowing you to create a robust program without needing to catch exceptions at every line of code. You simply need to call the `yDisableExceptions()` function to commute the library to a mode where exceptions for all the functions are systematically replaced by specific return values, which can be tested by the caller when necessary. For each function, the name of each return value in case of error is systematically documented in the library reference. The name always follows the same logic: a `get_state()` method returns a `Y_STATE_INVALID` value, a `get_currentValue` method returns a `Y_CURRENTVALUE_INVALID` value, and so on. In any case, the returned value is of the expected type and is not a null pointer which would risk crashing your program. At worst, if you display the value without testing it, it will be outside the expected bounds for the returned value. In the case of functions which do not normally return information, the return value is `YAPI_SUCCESS` if everything went well, and a different error code in case of failure.

When you work without exceptions, you can obtain an error code and an error message explaining the source of the error. You can request them from the object which returned the error, calling the `errType()` and `errMessage()` methods. Their returned values contain the same information as in the exceptions when they are active.

15. Using the Yocto-Demo with Java

Java is an object oriented language created by Sun Microsystem. Beside being free, its main strength is its portability. Unfortunately, this portability has an excruciating price. In Java, hardware abstraction is so high that it is almost impossible to work directly with the hardware. Therefore, the Yoctopuce API does not support native mode in regular Java. The Java API needs a Virtual Hub to communicate with Yoctopuce devices.

15.1. Getting ready

Go to the Yoctopuce web site and download the following items:

- The Java programming library[1]
- The VirtualHub software[2] for Windows, Mac OS X or Linux, depending on your OS

The library is available as source files as well as a *jar* file. Decompress the library files in a folder of your choice, connect your modules, run the VirtualHub software, and you are ready to start your first tests. You do not need to install any driver.

In order to keep them simple, all the examples provided in this documentation are console applications. Naturally, the libraries function in a strictly identical manner if you integrate them in an application with a graphical interface.

15.2. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a Java code snippet to use the Led function.

```
[...]

// Get access to your device, connected locally on USB for instance
YAPI.RegisterHub("127.0.0.1");
led = YLed.FindLed("YCTOPOC1-123456.led");

// Hot-plug is easy: just check that the device is online
if (led.isOnline())
   { //Use led.set_power()
     ...
   }
```

[1] www.yoctopuce.com/EN/libraries.php
[2] www.yoctopuce.com/EN/virtualhub.php

```
[...]
```

Let us look at these lines in more details.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. The parameter is the address of the Virtual Hub able to see the devices. If the initialization does not succeed, an exception is thrown.

YLed.FindLed

The `YLed.FindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led = YLed.FindLed("YCTOPOC1-123456.led")
led = YLed.FindLed("YCTOPOC1-123456.MyFunction")
led = YLed.FindLed("MyModule.led")
led = YLed.FindLed("MyModule.MyFunction")
led = YLed.FindLed("MyFunction")
```

`YLed.FindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `YLed.FindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `YLed.FindLed` allows you to turn on and off the led. The argument is YLed.POWER_ON or YLed.POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch you Java environment and open the corresponding sample project provided in the directory **Examples/Doc-GettingStarted-Yocto-Demo** of the Yoctopuce library.

In this example, you will recognize the functions explained above, but this time used with all the side materials needed to make it work nicely as a small demo.

```
/*
 * To change this template, choose Tools | Templates
 * and open the template in the editor.
 */
import com.yoctopuce.YoctoAPI.*;

/**
 *
 * @author yocto
 */
public class Demo {
    /**
     * @param args the command line arguments
     */
    public static void main(String[] args)    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
```

```
            System.exit(1);
        }

        YLed led;
        if (args.length > 0) {
            led = YLed.FindLed(args[0]);
        } else {
            led = YLed.FirstLed();
            if (led == null) {
                System.out.println("No module connected (check USB cable)");
                System.exit(1);
            }
        }

        try {
            System.out.println("Switch led ON");
            led.set_power(YLed.POWER_ON);
            YAPI.Sleep(1000);
            System.out.println("Switch led OFF");
            led.set_power(YLed.POWER_OFF);
        } catch (YAPI_Exception ex) {
            System.out.println("Module "+led.describe()+" not connected (check
identification and USB cable)");
        }

        YAPI.FreeAPI();
    }
}
```

15.3. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
import com.yoctopuce.YoctoAPI.*;
import java.util.logging.Level;
import java.util.logging.Logger;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }
        System.out.println("usage: demo [serial or logical name] [ON/OFF]");

        YModule module;
        if (args.length == 0) {
            module = YModule.FirstModule();
            if (module == null) {
                System.out.println("No module connected (check USB cable)");
                System.exit(1);
            }
        } else {
            module = YModule.FindModule(args[0]);  // use serial or logical name
        }

        try {
            if (args.length > 1) {
                if (args[1].equalsIgnoreCase("ON")) {
                    module.setBeacon(YModule.BEACON_ON);
                } else {
                    module.setBeacon(YModule.BEACON_OFF);
                }
            }
```

```
            System.out.println("serial:       " + module.get_serialNumber());
            System.out.println("logical name: " + module.get_logicalName());
            System.out.println("luminosity:   " + module.get_luminosity());
            if (module.get_beacon() == YModule.BEACON_ON) {
                System.out.println("beacon:       ON");
            } else {
                System.out.println("beacon:       OFF");
            }
            System.out.println("upTime:       " + module.get_upTime() / 1000 + " sec");
            System.out.println("USB current:  " + module.get_usbCurrent() + " mA");
            System.out.println("logs:\n" + module.get_lastLogs());
        } catch (YAPI_Exception ex) {
            System.out.println(args[1] + " not connected (check identification and USB
cable)");
        }
        YAPI.FreeAPI();
    }
}
```

Each property xxx of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
import com.yoctopuce.YoctoAPI.*;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }

        if (args.length != 2) {
            System.out.println("usage: demo <serial or logical name> <new logical name>");
            System.exit(1);
        }

        YModule m;
        String newname;

        m = YModule.FindModule(args[0]); // use serial or logical name

        try {
            newname = args[1];
            if (!YAPI.CheckLogicalName(newname))
                {
                    System.out.println("Invalid name (" + newname + ")");
                    System.exit(1);
                }

            m.set_logicalName(newname);
            m.saveToFlash(); // do not forget this

            System.out.println("Module: serial= " + m.get_serialNumber());
            System.out.println(" / name= " + m.get_logicalName());
        } catch (YAPI_Exception ex) {
            System.out.println("Module " + args[0] + "not connected (check identification
```

```
and USB cable)");
                System.out.println(ex.getMessage());
                System.exit(1);
            }

            YAPI.FreeAPI();
        }
}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
import com.yoctopuce.YoctoAPI.*;

public class Demo {

    public static void main(String[] args)
    {
        try {
            // setup the API to use local VirtualHub
            YAPI.RegisterHub("127.0.0.1");
        } catch (YAPI_Exception ex) {
            System.out.println("Cannot contact VirtualHub on 127.0.0.1 (" +
ex.getLocalizedMessage() + ")");
            System.out.println("Ensure that the VirtualHub application is running");
            System.exit(1);
        }

        System.out.println("Device list");
        YModule module = YModule.FirstModule();
        while (module != null) {
            try {
                System.out.println(module.get_serialNumber() + " (" +
module.get_productName() + ")");
            } catch (YAPI_Exception ex) {
                break;
            }
            module = module.nextModule();
        }

        YAPI.FreeAPI();
    }
}
```

15.4. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software.

In the Java API, error handling is implemented with exceptions. Therefore you must catch and handle correctly all exceptions that might be thrown by the API if you do not want your software to crash as soon as you unplug a device.

16. Using the Yocto-Demo with Android

To tell the truth, Android is not a programming language, it is an operating system developed by Google for mobile appliances such as smart phones and tablets. But it so happens that under Android everything is programmed with the same programming language: Java. Nevertheless, the programming paradigms and the possibilities to access the hardware are slightly different from classical Java, and this justifies a separate chapter on Android programming.

16.1. Native access and VirtualHub

In the opposite to the classical Java API, the Java for Android API can access USB modules natively. However, as there is no VirtualHub running under Android, it is not possible to remotely control Yoctopuce modules connected to a machine under Android. Naturally, the Java for Android API remains perfectly able to connect itself to a VirtualHub running on another OS.

16.2. Getting ready

Go to the Yoctopuce web site and download the Java for Android programming library[1]. The library is available as source files, and also as a jar file. Connect your modules, decompress the library files in the directory of your choice, and configure your Android programming environment so that it can find them.

To keep them simple, all the examples provided in this documentation are snippets of Android applications. You must integrate them in your own Android applications to make them work. However, your can find complete applications in the examples provided with the Java for Android library.

16.3. Compatibility

In an ideal world, you would only need to have a smart phone running under Android to be able to make Yoctopuce modules work. Unfortunately, it is not quite so in the real world. A machine running under Android must fulfil to a few requirements to be able to manage Yoctopuce USB modules natively.

[1] www.yoctopuce.com/EN/libraries.php

Android 4.x

Android 4.0 (api 14) and following are officially supported. Theoretically, support of USB *host* functions since Android 3.1. But be aware that the Yoctopuce Java for Android API is regularly tested only from Android 4 onwards.

USB *host* support

Naturally, not only must your machine have a USB port, this port must also be able to run in *host* mode. In *host* mode, the machine literally takes control of the devices which are connected to it. The USB ports of a desktop computer, for example, work in *host* mode. The opposite of the *host* mode is the *device* mode. USB keys, for instance, work in *device* mode: they must be controlled by a *host*. Some USB ports are able to work in both modes, they are *OTG* (*On The Go*) ports. It so happens that many mobile devices can only work in *device* mode: they are designed to be connected to a charger or a desktop computer, and nothing else. It is therefore highly recommended to pay careful attention to the technical specifications of a product working under Android before hoping to make Yoctopuce modules work with it.

Unfortunately, having a correct version of Android and USB ports working in *host* mode is not enough to guaranty that Yoctopuce modules will work well under Android. Indeed, some manufacturers configure their Android image so that devices other than keyboard and mass storage are ignored, and this configuration is hard to detect. As things currently stand, the best way to know if a given Android machine works with Yoctopuce modules consists in trying.

Supported hardware

The library is tested and validated on the following machines:

- Samsung Galaxy S3
- Samsung Galaxy Note 2
- Google Nexus 5
- Google Nexus 7
- Acer Iconia Tab A200
- Asus Tranformer Pad TF300T
- Kurio 7

If your Android machine is not able to control Yoctopuce modules natively, you still have the possibility to remotely control modules driven by a VirtualHub on another OS, or a YoctoHub [2].

16.4. Activating the USB port under Android

By default, Android does not allow an application to access the devices connected to the USB port. To enable your application to interact with a Yoctopuce module directly connected on your tablet on a USB port, a few additional steps are required. If you intend to interact only with modules connected on another machine through the network, you can ignore this section.

In your `AndroidManifest.xml`, you must declare using the "USB Host" functionality by adding the `<uses-feature android:name="android.hardware.usb.host" />` tag in the `manifest` section.

```
<manifest ...>
    ...
    <uses-feature android:name="android.hardware.usb.host" />;
    ...
</manifest>
```

When first accessing a Yoctopuce module, Android opens a window to inform the user that the application is going to access the connected module. The user can deny or authorize access to the device. If the user authorizes the access, the application can access the connected device as long as

[2] Yoctohubs are a plug and play way to add network connectivity to your Yoctopuce devices. more info on http://www.yoctopuce.com/EN/products/category/extensions-and-networking

it stays connected. To enable the Yoctopuce library to correctly manage these authorizations, your must provide a pointer on the application context by calling the EnableUSBHost method of the YAPI class before the first USB access. This function takes as arguments an object of the `android.content.Context` class (or of a subclass). As the Activity class is a subclass of `Context`, it is simpler to call `YAPI.EnableUSBHost(this);` in the method `onCreate` of your application. If the object passed as parameter is not of the correct type, a `YAPI_Exception` exception is generated.

```
...
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    try {
            // Pass the application Context to the Yoctopuce Library
        YAPI.EnableUSBHost(this);
        } catch (YAPI_Exception e) {
                Log.e("Yocto",e.getLocalizedMessage());
        }
}
...
```

Autorun

It is possible to register your application as a default application for a USB module. In this case, as soon as a module is connected to the system, the application is automatically launched. You must add *<action android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED"/>* in the section *<intent-filter>* of the main activity. The section *<activity>* must have a pointer to an XML file containing the list of USB modules which can run the application.

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    ...
    <uses-feature android:name="android.hardware.usb.host" />
    ...
    <application ... >
        <activity
            android:name=".MainActivity" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <action android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>

            <meta-data
                android:name="android.hardware.usb.action.USB_DEVICE_ATTACHED"
                android:resource="@xml/device_filter" />
        </activity>
    </application>

</manifest>
```

The XML file containing the list of modules allowed to run the application must be saved in the res/xml directory. This file contains a list of USB *vendorId* and *deviceID* in decimal. The following example runs the application as soon as a Yocto-Relay or a YoctoPowerRelay is connected. You can find the vendorID and the deviceID of Yoctopuce modules in the characteristics section of the documentation.

```
<?xml version="1.0" encoding="utf-8"?>

<resources>
    <usb-device vendor-id="9440" product-id="12" />
    <usb-device vendor-id="9440" product-id="13" />
</resources>
```

16.5. Control of the Led function

A few lines of code are enough to use a Yocto-Demo. Here is the skeleton of a Java code snippet to use the Led function.

```
[...]

// Retrieving the object representing the module (connected here locally by USB)
YAPI.EnableUSBHost(this);
YAPI.RegisterHub("usb");
led = YLed.FindLed("YCTOPOC1-123456.led");

// Hot-plug is easy: just check that the device is online
if (led.isOnline())
   { //Use led.set_power()
     ...
   }

[...]
```

Let us look at these lines in more details.

YAPI.EnableUSBHost

The `YAPI.EnableUSBHost` function initializes the API with the Context of the current application. This function takes as argument an object of the `android.content.Context` class (or of a subclass). If you intend to connect your application only to other machines through the network, this function is facultative.

YAPI.RegisterHub

The `yAPI.RegisterHub` function initializes the Yoctopuce API and indicates where the modules should be looked for. The parameter is the address of the virtual hub able to see the devices. If the string "usb" is passed as parameter, the API works with modules locally connected to the machine. If the initialization does not succeed, an exception is thrown.

YLed.FindLed

The `YLed.FindLed` function allows you to find a led from the serial number of the module on which it resides and from its function name. You can use logical names as well, as long as you have initialized them. Let us imagine a Yocto-Demo module with serial number *YCTOPOC1-123456* which you have named "*MyModule*", and for which you have given the *led* function the name "*MyFunction*". The following five calls are strictly equivalent, as long as "*MyFunction*" is defined only once.

```
led = YLed.FindLed("YCTOPOC1-123456.led")
led = YLed.FindLed("YCTOPOC1-123456.MyFunction")
led = YLed.FindLed("MyModule.led")
led = YLed.FindLed("MyModule.MyFunction")
led = YLed.FindLed("MyFunction")
```

`YLed.FindLed` returns an object which you can then use at will to control the led.

isOnline

The `isOnline()` method of the object returned by `YLed.FindLed` allows you to know if the corresponding module is present and in working order.

set_power

The `set_power()` function of the objet returned by `YLed.FindLed` allows you to turn on and off the led. The argument is YLed.POWER_ON or YLed.POWER_OFF. In the reference on the programming interface, you will find more methods to precisely control the luminosity and make the led blink automatically.

A real example

Launch you Java environment and open the corresponding sample project provided in the directory **Examples//Doc-Examples** of the Yoctopuce library.

In this example, you can recognize the functions explained above, but this time used with all the side materials needed to make it work nicely as a small demo.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.Spinner;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YLed;

public class GettingStarted_Yocto_Demo extends Activity implements OnItemSelectedListener
{

    private YLed led = null;
    private ArrayAdapter<String> aa;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.gettingstarted_yocto_demo);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
    {
        super.onStart();

        try {
            aa.clear();
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
            YLed r = YLed.FirstLed();
            while (r != null) {
                String hwid = r.get_hardwareId();
                aa.add(hwid);
                r = r.nextLed();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        // refresh Spinner with detected relay
        aa.notifyDataSetChanged();
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

    @Override
    public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
    {
        String hwid = parent.getItemAtPosition(pos).toString();
        led = YLed.FindLed(hwid);
    }
```

```
    @Override
    public void onNothingSelected(AdapterView<?> arg0)
    {
    }

    /** Called when the user touches the button State A */
    public void setLedOn(View view)
    {
        // Do something in response to button click
        if (led != null)
            try {
                led.setPower(YLed.POWER_ON);
            } catch (YAPI_Exception e) {
                e.printStackTrace();
            }
    }

    /** Called when the user touches the button State B */
    public void setLedOff(View view)
    {
        // Do something in response to button click
        if (led != null)
            try {
                led.setPower(YLed.POWER_OFF);
            } catch (YAPI_Exception e) {
                e.printStackTrace();
            }
    }

}
```

16.6. Control of the module part

Each module can be controlled in a similar manner, you can find below a simple sample program displaying the main parameters of the module and enabling you to activate the localization beacon.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.util.Log;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.Spinner;
import android.widget.Switch;
import android.widget.TextView;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class ModuleControl extends Activity implements OnItemSelectedListener
{

    private ArrayAdapter<String> aa;
    private YModule module = null;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.modulecontrol);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
```

```
    {
        super.onStart();

        try {
            aa.clear();
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
            YModule r = YModule.FirstModule();
            while (r != null) {
                String hwid = r.get_hardwareId();
                aa.add(hwid);
                r = r.nextModule();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        // refresh Spinner with detected relay
        aa.notifyDataSetChanged();
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

    private void DisplayModuleInfo()
    {
        TextView field;
        if (module == null)
            return;
        try {
            field = (TextView) findViewById(R.id.serialfield);
            field.setText(module.getSerialNumber());
            field = (TextView) findViewById(R.id.logicalnamefield);
            field.setText(module.getLogicalName());
            field = (TextView) findViewById(R.id.luminosityfield);
            field.setText(String.format("%d%%", module.getLuminosity()));
            field = (TextView) findViewById(R.id.uptimefield);
            field.setText(module.getUpTime() / 1000 + " sec");
            field = (TextView) findViewById(R.id.usbcurrentfield);
            field.setText(module.getUsbCurrent() + " mA");
            Switch sw = (Switch) findViewById(R.id.beaconswitch);
            Log.d("switch", "beacon" + module.get_beacon());
            sw.setChecked(module.getBeacon() == YModule.BEACON_ON);
            field = (TextView) findViewById(R.id.logs);
            field.setText(module.get_lastLogs());

        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
    {
        String hwid = parent.getItemAtPosition(pos).toString();
        module = YModule.FindModule(hwid);
        DisplayModuleInfo();
    }

    @Override
    public void onNothingSelected(AdapterView<?> arg0)
    {
    }

    public void refreshInfo(View view)
    {
        DisplayModuleInfo();
    }

    public void toggleBeacon(View view)
    {
        if (module == null)
            return;
        boolean on = ((Switch) view).isChecked();
```

```
        try {
            if (on) {
                module.setBeacon(YModule.BEACON_ON);
            } else {
                module.setBeacon(YModule.BEACON_OFF);
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }
}
```

Each property xxx of the module can be read thanks to a method of type `YModule.get_xxxx()`, and properties which are not read-only can be modified with the help of the `YModule.set_xxx()` method. For more details regarding the used functions, refer to the API chapters.

Changing the module settings

When you want to modify the settings of a module, you only need to call the corresponding `YModule.set_xxx()` function. However, this modification is performed only in the random access memory (RAM) of the module: if the module is restarted, the modifications are lost. To memorize them persistently, it is necessary to ask the module to save its current configuration in its permanent memory. To do so, use the `YModule.saveToFlash()` method. Inversely, it is possible to force the module to forget its current settings by using the `YModule.revertFromFlash()` method. The short example below allows you to modify the logical name of a module.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.ArrayAdapter;
import android.widget.EditText;
import android.widget.Spinner;
import android.widget.TextView;
import android.widget.Toast;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class SaveSettings extends Activity implements OnItemSelectedListener
{

    private ArrayAdapter<String> aa;
    private YModule module = null;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.savesettings);
        Spinner my_spin = (Spinner) findViewById(R.id.spinner1);
        my_spin.setOnItemSelectedListener(this);
        aa = new ArrayAdapter<String>(this, android.R.layout.simple_spinner_item);
        aa.setDropDownViewResource(android.R.layout.simple_spinner_dropdown_item);
        my_spin.setAdapter(aa);
    }

    @Override
    protected void onStart()
    {
        super.onStart();

        try {
            aa.clear();
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
            YModule r = YModule.FirstModule();
            while (r != null) {
                String hwid = r.get_hardwareId();
                aa.add(hwid);
```

```
                r = r.nextModule();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        // refresh Spinner with detected relay
        aa.notifyDataSetChanged();
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

    private void DisplayModuleInfo()
    {
        TextView field;
        if (module == null)
            return;
        try {
            YAPI.UpdateDeviceList();// fixme
            field = (TextView) findViewById(R.id.logicalnamefield);
            field.setText(module.getLogicalName());
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    public void onItemSelected(AdapterView<?> parent, View view, int pos, long id)
    {
        String hwid = parent.getItemAtPosition(pos).toString();
        module = YModule.FindModule(hwid);
        DisplayModuleInfo();
    }

    @Override
    public void onNothingSelected(AdapterView<?> arg0)
    {
    }

    public void saveName(View view)
    {
        if (module == null)
            return;

        EditText edit = (EditText) findViewById(R.id.newname);
        String newname = edit.getText().toString();
        try {
            if (!YAPI.CheckLogicalName(newname)) {
                Toast.makeText(getApplicationContext(), "Invalid name (" + newname + ")",
Toast.LENGTH_LONG).show();
                return;
            }
            module.set_logicalName(newname);
            module.saveToFlash(); // do not forget this
            edit.setText("");
        } catch (YAPI_Exception ex) {
            ex.printStackTrace();
        }
        DisplayModuleInfo();
    }

}
```

Warning: the number of write cycles of the nonvolatile memory of the module is limited. When this limit is reached, nothing guaranties that the saving process is performed correctly. This limit, linked to the technology employed by the module micro-processor, is located at about 100000 cycles. In short, you can use the `YModule.saveToFlash()` function only 100000 times in the life of the module. Make sure you do not call this function within a loop.

Listing the modules

Obtaining the list of the connected modules is performed with the `YModule.yFirstModule()` function which returns the first module found. Then, you only need to call the `nextModule()` function of this object to find the following modules, and this as long as the returned value is not `null`. Below a short example listing the connected modules.

```
package com.yoctopuce.doc_examples;

import android.app.Activity;
import android.os.Bundle;
import android.view.View;
import android.widget.LinearLayout;
import android.widget.TextView;

import com.yoctopuce.YoctoAPI.YAPI;
import com.yoctopuce.YoctoAPI.YAPI_Exception;
import com.yoctopuce.YoctoAPI.YModule;

public class Inventory extends Activity
{

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.inventory);
    }

    public void refreshInventory(View view)
    {
        LinearLayout layout = (LinearLayout) findViewById(R.id.inventoryList);
        layout.removeAllViews();

        try {
            YAPI.UpdateDeviceList();
            YModule module = YModule.FirstModule();
            while (module != null) {
                String line = module.get_serialNumber() + " (" + module.get_productName() +
")";
                TextView tx = new TextView(this);
                tx.setText(line);
                layout.addView(tx);
                module = module.nextModule();
            }
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
    }

    @Override
    protected void onStart()
    {
        super.onStart();
        try {
            YAPI.EnableUSBHost(this);
            YAPI.RegisterHub("usb");
        } catch (YAPI_Exception e) {
            e.printStackTrace();
        }
        refreshInventory(null);
    }

    @Override
    protected void onStop()
    {
        super.onStop();
        YAPI.FreeAPI();
    }

}
```

16.7. Error handling

When you implement a program which must interact with USB modules, you cannot disregard error handling. Inevitably, there will be a time when a user will have unplugged the device, either before running the software, or even while the software is running. The Yoctopuce library is designed to help you support this kind of behavior, but your code must nevertheless be conceived to interpret in the best possible way the errors indicated by the library.

The simplest way to work around the problem is the one used in the short examples provided in this chapter: before accessing a module, check that it is online with the `isOnline` function, and then hope that it will stay so during the fraction of a second necessary for the following code lines to run. This method is not perfect, but it can be sufficient in some cases. You must however be aware that you cannot completely exclude an error which would occur after the call to `isOnline` and which could crash the software.

In the Java API for Android, error handling is implemented with exceptions. Therefore you must catch and handle correctly all exceptions that might be thrown by the API if you do not want your software to crash soon as you unplug a device.

17. Advanced programming

The preceding chapters have introduced, in each available language, the basic programming functions which can be used with your Yocto-Demo module. This chapter presents in a more generic manner a more advanced use of your module. Examples are provided in the language which is the most popular among Yoctopuce customers, that is C#. Nevertheless, you can find complete examples illustrating the concepts presented here in the programming libraries of each language.

To remain as concise as possible, examples provided in this chapter do not perform any error handling. Do not copy them "as is" in a production application.

17.1. Event programming

The methods to manage Yoctopuce modules which we presented to you in preceding chapters were polling functions, consisting in permanently asking the API if something had changed. While easy to understand, this programming technique is not the most efficient, nor the most reactive. Therefore, the Yoctopuce programming API also provides an event programming model. This technique consists in asking the API to signal by itself the important changes as soon as they are detected. Each time a key parameter is modified, the API calls a callback function which you have defined in advance.

Detecting module arrival and departure

Hot-plug management is important when you work with USB modules because, sooner or later, you will have to connect or disconnect a module when your application is running. The API is designed to manage module unexpected arrival or departure in a transparent way. But your application must take this into account if it wants to avoid pretending to use a disconnected module.

Event programming is particularly useful to detect module connection/disconnection. Indeed, it is simpler to be told of new connections rather than to have to permanently list the connected modules to deduce which ones just arrived and which ones left. To be warned as soon as a module is connected, you need three pieces of code.

The callback
The callback is the function which is called each time a new Yoctopuce module is connected. It takes as parameter the relevant module.

```
 static void deviceArrival(YModule m)
{
  Console.WriteLine("New module  : " + m.get_serialNumber());
}
```

Initialization
You must then tell the API that it must call the callback when a new module is connected.

```
YAPI.RegisterDeviceArrivalCallback(deviceArrival);
```

Note that if modules are already connected when the callback is registered, the callback is called for each of the already connected modules.

Triggering callbacks
A classis issue of callback programming is that these callbacks can be triggered at any time, including at times when the main program is not ready to receive them. This can have undesired side effects, such as dead-locks and other race conditions. Therefore, in the Yoctopuce API, module arrival/departure callbacks are called only when the `UpdateDeviceList()` function is running. You only need to call `UpdateDeviceList()` at regular intervals from a timer or from a specific thread to precisely control when the calls to these callbacks happen:

```
// waiting loop managing callbacks
while (true)
{
    // module arrival / departure callback
    YAPI.UpdateDeviceList(ref errmsg);
    // non active waiting time managing other callbacks
    YAPI.Sleep(500, ref errmsg);
}
```

In a similar way, it is possible to have a callback when a module is disconnected. You can find a complete example implemented in your favorite programming language in the *Examples/Prog-EventBased* directory of the corresponding library.

Be aware that in most programming languages, callbacks must be global procedures, and not methods. If you wish for the callback to call the method of an object, define your callback as a global procedure which then calls your method.

18. Using with unsupported languages

Yoctopuce modules can be driven from most common programming languages. New languages are regularly added, depending on the interest expressed by Yoctopuce product users. Nevertheless, some languages are not, and will never be, supported by Yoctopuce. There can be several reasons for this: compilers which are not available anymore, unadapted environments, etc.

However, there are alternative methods to access Yoctopuce modules from an unsupported programming language.

18.1. Command line

The easiest method to drive Yoctopuce modules from an unsupported programming language is to use the command line API through system calls. The command line API is in fact made of a group of small executables which are easy to call. Their output is also easy to analyze. As most programming languages allow you to make system calls, the issue is solved with a few lines of code.

However, if the command line API is the easiest solution, it is neither the fastest nor the most efficient. For each call, the executable must initialize its own API and make an inventory of USB connected modules. This requires about one second per call.

18.2. VirtualHub and HTTP GET

The *VirtualHub* is available on almost all current platforms. It is generally used as a gateway to provide access to Yoctopuce modules from languages which prevent direct access to hardware layers of a computer (JavaScript, PHP, Java, ...).

In fact, the *VirtualHub* is a small web server able to route HTTP requests to Yoctopuce modules. This means that if you can make an HTTP request from your programming language, you can drive Yoctopuce modules, even if this language is not officially supported.

REST interface

At a low level, the modules are driven through a REST API. Thus, to control a module, you only need to perform appropriate requests on the *VirtualHub*. By default, the *VirtualHub* HTTP port is 4444.

An important advantage of this technique is that preliminary tests are very easy to implement. You only need a *VirtualHub* and a simple web browser. If you copy the following URL in your preferred browser, while the *VirtualHub* is running, you obtain the list of the connected modules.

```
http://127.0.0.1:4444/api/services/whitePages.txt
```

Note that the result is displayed as text, but if you request *whitePages.xml*, you obtain an XML result. Likewise, *whitePages.json* allows you to obtain a JSON result. The *html* extension even allows you to display a rough interface where you can modify values in real time. The whole REST API is available in these different formats.

Driving a module through the REST interface

Each Yoctopuce module has its own REST interface, available in several variants. Let us imagine a Yocto-Demo with the *YCTOPOC1-12345* serial number and the *myModule* logical name. The following URL allows you to know the state of the module.

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/module.txt
```

You can naturally also use the module logical name rather than its serial number.

```
http://127.0.0.1:4444/byName/myModule/api/module.txt
```

To retrieve the value of a module property, simply add the name of the property below *module*. For example, if you want to know the signposting led luminosity, send the following request:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/module/luminosity
```

To change the value of a property, modify the corresponding attribute. Thus, to modify the luminosity, send the following request:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/module?luminosity=100
```

Driving the module functions through the REST interface

The module functions can be manipulated in the same way. To know the state of the led function, build the following URL:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/led.txt
```

Note that if you can use logical names for the modules instead of their serial number, you cannot use logical names for functions. Only hardware names are authorized to access functions.

You can retrieve a module function attribute in a way rather similar to that used with the modules. For example:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/led/logicalName
```

Rather logically, attributes can be modified in the same manner.

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/api/led?logicalName=myFunction
```

You can find the list of available attributes for your Yocto-Demo at the beginning of the *Programming* chapter.

Accessing Yoctopuce data logger through the REST interface

This section only applies to devices with a built-in data logger.

The preview of all recorded data streams can be retrieved in JSON format using the following URL:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/dataLogger.json
```

Individual measures for any given stream can be obtained by appending the desired function identifier as well as start time of the stream:

```
http://127.0.0.1:4444/bySerial/YCTOPOC1-12345/dataLogger.json?id=led&utc=1389801080
```

18.3. Using dynamic libraries

The low level Yoctopuce API is available under several formats of dynamic libraries written in C. The sources are available with the C++ API. If you use one of these low level libraries, you do not need the *VirtualHub* anymore.

Filename	Platform
libyapi.dylib	Max OS X
libyapi-amd64.so	Linux Intel (64 bits)
libyapi-armel.so	Linux ARM EL
libyapi-armhf.so	Linux ARM HL
libyapi-i386.so	Linux Intel (32 bits)
yapi64.dll	Windows (64 bits)
yapi.dll	Windows (32 bits)

These dynamic libraries contain all the functions necessary to completely rebuild the whole high level API in any language able to integrate these libraries. This chapter nevertheless restrains itself to describing basic use of the modules.

Driving a module

The three essential functions of the low level API are the following:

```
int yapiInitAPI(int connection_type, char *errmsg);
int yapiUpdateDeviceList(int forceupdate, char *errmsg);
int yapiHTTPRequest(char *device, char *request, char* buffer,int buffsize,int *fullsize,
char *errmsg);
```

The *yapiInitAPI* function initializes the API and must be called once at the beginning of the program. For a USB type connection, the *connection_type* parameter takes value 1. The *errmsg* parameter must point to a 255 character buffer to retrieve a potential error message. This pointer can also point to *null*. The function returns a negative integer in case of error, zero otherwise.

The *yapiUpdateDeviceList* manages the inventory of connected Yoctopuce modules. It must be called at least once. To manage hot plug and detect potential newly connected modules, this function must be called at regular intervals. The *forceupdate* parameter must take value 1 to force a hardware scan. The *errmsg* parameter must point to a 255 character buffer to retrieve a potential error message. This pointer can also point to *null*. The function returns a negative integer in case of error, zero otherwise.

Finally, the *yapiHTTPRequest* function sends HTTP requests to the module REST API. The *device* parameter contains the serial number or the logical name of the module which you want to reach. The *request* parameter contains the full HTTP request (including terminal line breaks). *buffer* points to a character buffer long enough to contain the answer. *buffsize* is the size of the buffer. *fullsize* is a pointer to an integer to which will be assigned the actual size of the answer. The *errmsg* parameter must point to a 255 character buffer to retrieve a potential error message. This pointer can also point to *null*. The function returns a negative integer in case of error, zero otherwise.

The format of the requests is the same as the one described in the *VirtualHub et HTTP GET* section. All the character strings used by the API are strings made of 8-bit characters: Unicode and UTF8 are not supported.

The resutlt returned in the buffer variable respects the HTTP protocol. It therefore includes an HTTP header. This header ends with two empty lines, that is a sequence of four ASCII characters 13, 10, 13, 10.

Here is a sample program written in pascal using the *yapi.dll* DLL to read and then update the luminosity of a module.

```
// Dll functions import
function  yapiInitAPI(mode:integer;
                      errmsg : pansichar):integer;cdecl;
                      external 'yapi.dll' name 'yapiInitAPI';
function  yapiUpdateDeviceList(force:integer;errmsg : pansichar):integer;cdecl;
                      external 'yapi.dll' name 'yapiUpdateDeviceList';
function  yapiHTTPRequest(device:pansichar;url:pansichar; buffer:pansichar;
                      buffsize:integer;var fullsize:integer;
                      errmsg : pansichar):integer;cdecl;
                      external 'yapi.dll' name 'yapiHTTPRequest';

var
 errmsgBuffer  : array [0..256] of ansichar;
 dataBuffer    : array [0..1024] of ansichar;
 errmsg,data   : pansichar;
 fullsize,p    : integer;

const
  serial      = 'YCTOPOC1-12345';
  getValue = 'GET /api/module/luminosity HTTP/1.1'#13#10#13#10;
  setValue = 'GET /api/module?luminosity=100 HTTP/1.1'#13#10#13#10;

begin
  errmsg  :=  @errmsgBuffer;
  data    :=  @dataBuffer;
  // API  initialization
  if(yapiInitAPI(1,errmsg)<0) then
   begin
    writeln(errmsg);
    halt;
  end;

  // forces a device inventory
  if( yapiUpdateDeviceList(1,errmsg)<0) then
    begin
     writeln(errmsg);
     halt;
   end;

  // requests the  module luminosity
  if (yapiHTTPRequest(serial,getValue,data,sizeof(dataBuffer),fullsize,errmsg)<0) then
   begin
     writeln(errmsg);
     halt;
   end;

  // searches for the HTTP header end
  p := pos(#13#10#13#10,data);

  // displays the response minus the HTTP header
  writeln(copy(data,p+4,length(data)-p-3));

  // changes the luminosity
  if (yapiHTTPRequest(serial,setValue,data,sizeof(dataBuffer),fullsize,errmsg)<0) then
   begin
     writeln(errmsg);
     halt;
   end;

end.
```

Module inventory

To perform an inventory of Yoctopuce modules, you need two functions from the dynamic library:

```
int yapiGetAllDevices(int *buffer,int maxsize,int *neededsize,char *errmsg);
int yapiGetDeviceInfo(int devdesc,yDeviceSt *infos, char *errmsg);
```

The *yapiGetAllDevices* function retrieves the list of all connected modules as a list of handles. *buffer* points to a 32-bit integer array which contains the returned handles. *maxsize* is the size in bytes of the buffer. To *neededsize* is assigned the necessary size to store all the handles. From this, you can deduce either the number of connected modules or that the input buffer is too small. The *errmsg* parameter must point to a 255 character buffer to retrieve a potential error message. This pointer can also point to *null*. The function returns a negative integer in case of error, zero otherwise.

The *yapiGetDeviceInfo* function retrieves the information related to a module from its handle. *devdesc* is a 32-bit integer representing the module and which was obtained through *yapiGetAllDevices*. *infos* points to a data structure in which the result is stored. This data structure has the following format:

Name	Type	Size (bytes)	Description
vendorid	int	4	Yoctopuce USB ID
deviceid	int	4	Module USB ID
devrelease	int	4	Module version
nbinbterfaces	int	4	Number of USB interfaces used by the module
manufacturer	char[]	20	Yoctopuce (null terminated)
productname	char[]	28	Model (null terminated)
serial	char[]	20	Serial number (null terminated)
logicalname	char[]	20	Logical name (null terminated)
firmware	char[]	22	Firmware version (null terminated)
beacon	byte	1	Beacon state (0/1)

The *errmsg* parameter must point to a 255 character buffer to retrieve a potential error message.

Here is a sample program written in pascal using the *yapi.dll* DLL to list the connected modules.

```
// device description structure
type yDeviceSt = packed record
   vendorid        : word;
   deviceid        : word;
   devrelease      : word;
   nbinbterfaces   : word;
   manufacturer    : array [0..19] of ansichar;
   productname     : array [0..27] of ansichar;
   serial          : array [0..19] of ansichar;
   logicalname     : array [0..19] of ansichar;
   firmware        : array [0..21] of ansichar;
   beacon          : byte;
 end;

// Dll function import
function  yapiInitAPI(mode:integer;
                      errmsg : pansichar):integer;cdecl;
                      external 'yapi.dll' name 'yapiInitAPI';

function  yapiUpdateDeviceList(force:integer;errmsg : pansichar):integer;cdecl;
                      external 'yapi.dll' name 'yapiUpdateDeviceList';

function  yapiGetAllDevices( buffer:pointer;
                             maxsize:integer;
                             var neededsize:integer;
                             errmsg : pansichar):integer; cdecl;
                             external 'yapi.dll' name 'yapiGetAllDevices';

function  apiGetDeviceInfo(d:integer; var infos:yDeviceSt;
                             errmsg : pansichar):integer;  cdecl;
                             external 'yapi.dll' name 'yapiGetDeviceInfo';


var
 errmsgBuffer  : array [0..256] of ansichar;
 dataBuffer    : array [0..127] of integer;   // max of 128 USB devices
 errmsg,data   : pansichar;
 neededsize,i  : integer;
 devinfos      : yDeviceSt;

begin
  errmsg  :=  @errmsgBuffer;

  // API  initialization
  if(yapiInitAPI(1,errmsg)<0) then
   begin
    writeln(errmsg);
```

```
    halt;
  end;

   // forces a device inventory
  if( yapiUpdateDeviceList(1,errmsg)<0) then
    begin
     writeln(errmsg);
     halt;
   end;

  // loads all device handles into dataBuffer
  if yapiGetAllDevices(@dataBuffer,sizeof(dataBuffer),neededsize,errmsg)<0 then
    begin
     writeln(errmsg);
     halt;
    end;

  // gets device info from each handle
  for i:=0 to  neededsize div sizeof(integer)-1 do
   begin
     if (apiGetDeviceInfo(dataBuffer[i], devinfos, errmsg)<0) then
       begin
         writeln(errmsg);
         halt;
       end;
     writeln(pansichar(@devinfos.serial)+' ('+pansichar(@devinfos.productname)+')');
   end;

end.
```

VB6 and yapi.dll

Each entry point from the yapi.dll is duplicated. You will find one regular C-decl version and one Visual Basic 6 compatible version, prefixed with *vb6_*.

18.4. Porting the high level library

As all the sources of the Yoctopuce API are fully provided, you can very well port the whole API in the language of your choice. Note, however, that a large portion of the API source code is automatically generated.

Therefore, it is not necessary for you to port the complete API. You only need to port the *yocto_api* file and one file corresponding to a function, for example *yocto_relay*. After a little additional work, Yoctopuce is then able to generate all other files. Therefore, we highly recommend that you contact Yoctopuce support before undertaking to port the Yoctopuce library in another language. Collaborative work is advantageous to both parties.

19. High-level API Reference

This chapter summarizes the high-level API functions to drive your Yocto-Demo. Syntax and exact type names may vary from one language to another, but, unless otherwise stated, all the functions are available in every language. For detailed information regarding the types of arguments and return values for a given language, refer to the definition file for this language (`yocto_api.*` as well as the other `yocto_*` files that define the function interfaces).

For languages which support exceptions, all of these functions throw exceptions in case of error by default, rather than returning the documented error value for each function. This is by design, to facilitate debugging. It is however possible to disable the use of exceptions using the `yDisableExceptions()` function, in case you prefer to work with functions that return error values.

This chapter does not repeat the programming concepts described earlier, in order to stay as concise as possible. In case of doubt, do not hesitate to go back to the chapter describing in details all configurable attributes.

19.1. General functions

These general functions should be used to initialize and configure the Yoctopuce library. In most cases, a simple call to function `yRegisterHub()` should be enough. The module-specific functions `yFind...()` or `yFirst...()` should then be used to retrieve an object that provides interaction with the module.

In order to use the functions described here, you should include:

js	<script type='text/javascript' src='yocto_api.js'></script>

nodejs	var yoctolib = require('yoctolib');
	var YAPI = yoctolib.YAPI;
	var YModule = yoctolib.YModule;

php	require_once('yocto_api.php');
cpp	#include "yocto_api.h"
m	#import "yocto_api.h"
pas	uses yocto_api;
vb	yocto_api.vb
cs	yocto_api.cs
java	import com.yoctopuce.YoctoAPI.YModule;
py	from yocto_api import *

Global functions
yCheckLogicalName(**name**) Checks if a given string is valid as logical name for a module or a function.
yDisableExceptions() Disables the use of exceptions to report runtime errors.
yEnableExceptions() Re-enables the use of exceptions for runtime error handling.
yEnableUSBHost(**osContext**) This function is used only on Android.
yFreeAPI() Frees dynamically allocated memory blocks used by the Yoctopuce library.
yGetAPIVersion() Returns the version identifier for the Yoctopuce library in use.
yGetTickCount() Returns the current value of a monotone millisecond-based time counter.
yHandleEvents(**errmsg**) Maintains the device-to-library communication channel.
yInitAPI(**mode**, **errmsg**) Initializes the Yoctopuce programming library explicitly.
yPreregisterHub(**url**, **errmsg**) Fault-tolerant alternative to RegisterHub().
yRegisterDeviceArrivalCallback(**arrivalCallback**) Register a callback function, to be called each time a device is plugged.
yRegisterDeviceRemovalCallback(**removalCallback**) Register a callback function, to be called each time a device is unplugged.
yRegisterHub(**url**, **errmsg**) Setup the Yoctopuce library to use modules connected on a given machine.
yRegisterHubDiscoveryCallback(**hubDiscoveryCallback**)

Register a callback function, to be called each time an Network Hub send an SSDP message.

yRegisterLogFunction(logfun)

Registers a log callback function.

ySelectArchitecture(arch)

Select the architecture or the library to be loaded to access to USB.

ySetDelegate(object)

(Objective-C only) Register an object that must follow the protocol `YDeviceHotPlug`.

ySetTimeout(callback, ms_timeout, arguments)

Invoke the specified callback function after a given timeout.

ySleep(ms_duration, errmsg)

Pauses the execution flow for a specified duration.

yTriggerHubDiscovery(errmsg)

Force a hub discovery, if a callback as been registered with `yRegisterDeviceRemovalCallback` it will be called for each net work hub that will respond to the discovery.

yUnregisterHub(url)

Setup the Yoctopuce library to no more use modules connected on a previously registered machine with RegisterHub.

yUpdateDeviceList(errmsg)

Triggers a (re)detection of connected Yoctopuce modules.

yUpdateDeviceList_async(callback, context)

Triggers a (re)detection of connected Yoctopuce modules.

YAPI.CheckLogicalName() yCheckLogicalName() — YAPI

Checks if a given string is valid as logical name for a module or a function.

js	function **yCheckLogicalName**(**name**)
nodejs	function **CheckLogicalName**(**name**)
php	function **yCheckLogicalName**(**$name**)
cpp	bool **yCheckLogicalName**(const string& **name**)
m	+(BOOL) **CheckLogicalName** :(NSString *) **name**
pas	function **yCheckLogicalName**(**name**: string): boolean
vb	function **yCheckLogicalName**(ByVal **name** As String) As Boolean
cs	bool **CheckLogicalName**(string **name**)
java	boolean **CheckLogicalName**(String **name**)
py	def **CheckLogicalName**(**name**)

A valid logical name has a maximum of 19 characters, all among `A..Z`, `a..z`, `0..9`, `_`, and `-`. If you try to configure a logical name with an incorrect string, the invalid characters are ignored.

Parameters :

name a string containing the name to check.

Returns :

`true` if the name is valid, `false` otherwise.

YAPI.DisableExceptions() yDisableExceptions() — YAPI

Disables the use of exceptions to report runtime errors.

js	function **yDisableExceptions**( )
nodejs	function **DisableExceptions**( )
php	function **yDisableExceptions**( )
cpp	void **yDisableExceptions**( )
m	+(void) **DisableExceptions**
pas	procedure **yDisableExceptions**( )
vb	procedure **yDisableExceptions**( )
cs	void **DisableExceptions**( )
py	def **DisableExceptions**( )

When exceptions are disabled, every function returns a specific error value which depends on its type and which is documented in this reference manual.

YAPI.EnableExceptions() yEnableExceptions() — YAPI

Re-enables the use of exceptions for runtime error handling.

js	function **yEnableExceptions**( )
nodejs	function **EnableExceptions**( )
php	function **yEnableExceptions**( )
cpp	void **yEnableExceptions**( )
m	+(void) **EnableExceptions**
pas	procedure **yEnableExceptions**( )
vb	procedure **yEnableExceptions**( )
cs	void **EnableExceptions**( )
py	def **EnableExceptions**( )

Be aware than when exceptions are enabled, every function that fails triggers an exception. If the exception is not caught by the user code, it either fires the debugger or aborts (i.e. crash) the program. On failure, throws an exception or returns a negative error code.

YAPI.EnableUSBHost() yEnableUSBHost() — YAPI

This function is used only on Android.

`java` void **EnableUSBHost**(Object **osContext**)

Before calling `yRegisterHub("usb")` you need to activate the USB host port of the system. This function takes as argument, an object of class android.content.Context (or any subclass). It is not necessary to call this function to reach modules through the network.

Parameters :

osContext an object of class android.content.Context (or any subclass).

YAPI.FreeAPI() yFreeAPI() YAPI

Frees dynamically allocated memory blocks used by the Yoctopuce library.

js	function **yFreeAPI**( )
nodejs	function **FreeAPI**( )
php	function **yFreeAPI**( )
cpp	void **yFreeAPI**( )
m	+(void) **FreeAPI**
pas	procedure **yFreeAPI**( )
vb	procedure **yFreeAPI**( )
cs	void **FreeAPI**( )
java	void **FreeAPI**( )
py	def **FreeAPI**( )

It is generally not required to call this function, unless you want to free all dynamically allocated memory blocks in order to track a memory leak for instance. You should not call any other library function after calling `yFreeAPI()`, or your program will crash.

YAPI.GetAPIVersion() yGetAPIVersion() YAPI

Returns the version identifier for the Yoctopuce library in use.

js	function **yGetAPIVersion**( )
nodejs	function **GetAPIVersion**( )
php	function **yGetAPIVersion**( )
cpp	string **yGetAPIVersion**( )
m	+(NSString*) **GetAPIVersion**
pas	function **yGetAPIVersion**( ): string
vb	function **yGetAPIVersion**( ) As String
cs	String **GetAPIVersion**( )
java	String **GetAPIVersion**( )
py	def **GetAPIVersion**( )

The version is a string in the form `"Major.Minor.Build"`, for instance `"1.01.5535"`. For languages using an external DLL (for instance C#, VisualBasic or Delphi), the character string includes as well the DLL version, for instance `"1.01.5535 (1.01.5439)"`.

If you want to verify in your code that the library version is compatible with the version that you have used during development, verify that the major number is strictly equal and that the minor number is greater or equal. The build number is not relevant with respect to the library compatibility.

Returns :
a character string describing the library version.

YAPI.GetTickCount() yGetTickCount() YAPI

Returns the current value of a monotone millisecond-based time counter.

js	function **yGetTickCount**( )
nodejs	function **GetTickCount**( )
php	function **yGetTickCount**( )
cpp	u64 **yGetTickCount**( )
m	+(u64) **GetTickCount**
pas	function **yGetTickCount**( ): u64
vb	function **yGetTickCount**( ) As Long
cs	ulong **GetTickCount**( )
java	long **GetTickCount**( )
py	def **GetTickCount**( )

This counter can be used to compute delays in relation with Yoctopuce devices, which also uses the millisecond as timebase.

Returns :
a long integer corresponding to the millisecond counter.

YAPI.HandleEvents() yHandleEvents() YAPI

Maintains the device-to-library communication channel.

js	function **yHandleEvents**(**errmsg**)
nodejs	function **HandleEvents**(**errmsg**)
php	function **yHandleEvents**(**&$errmsg**)
cpp	YRETCODE **yHandleEvents**(string& **errmsg**)
m	+(YRETCODE) **HandleEvents** :(NSError**) **errmsg**
pas	function **yHandleEvents**(var **errmsg**: string): integer
vb	function **yHandleEvents**(ByRef **errmsg** As String) As YRETCODE
cs	YRETCODE **HandleEvents**(ref string **errmsg**)
java	int **HandleEvents**( )
py	def **HandleEvents**(**errmsg**=None)

If your program includes significant loops, you may want to include a call to this function to make sure that the library takes care of the information pushed by the modules on the communication channels. This is not strictly necessary, but it may improve the reactivity of the library for the following commands.

This function may signal an error in case there is a communication problem while contacting a module.

Parameters :

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.InitAPI() yInitAPI()

YAPI

Initializes the Yoctopuce programming library explicitly.

js	function **yInitAPI**(**mode**, **errmsg**)
nodejs	function **InitAPI**(**mode**, **errmsg**)
php	function **yInitAPI**(**$mode**, **&$errmsg**)
cpp	YRETCODE **yInitAPI**(int **mode**, string& **errmsg**)
m	+(YRETCODE) **InitAPI** :(int) **mode** :(NSError**) **errmsg**
pas	function **yInitAPI**(**mode**: integer, var **errmsg**: string): integer
vb	function **yInitAPI**(ByVal **mode** As Integer, ByRef **errmsg** As String) As Integer
cs	int **InitAPI**(int **mode**, ref string **errmsg**)
java	int **InitAPI**(int **mode**)
py	def **InitAPI**(**mode**, **errmsg**=None)

It is not strictly needed to call `yInitAPI()`, as the library is automatically initialized when calling `yRegisterHub()` for the first time.

When `Y_DETECT_NONE` is used as detection `mode`, you must explicitly use `yRegisterHub()` to point the API to the VirtualHub on which your devices are connected before trying to access them.

Parameters :

mode an integer corresponding to the type of automatic device detection to use. Possible values are `Y_DETECT_NONE`, `Y_DETECT_USB`, `Y_DETECT_NET`, and `Y_DETECT_ALL`.

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.PreregisterHub() yPreregisterHub() — YAPI

Fault-tolerant alternative to RegisterHub().

js	function **yPreregisterHub**(**url**, **errmsg**)
nodejs	function **PreregisterHub**(**url**, **errmsg**)
php	function **yPreregisterHub**(**$url**, **&$errmsg**)
cpp	YRETCODE **yPreregisterHub**(const string& **url**, string& **errmsg**)
m	+(YRETCODE) **PreregisterHub** :(NSString *) **url** :(NSError**) **errmsg**
pas	function **yPreregisterHub**(**url**: string, var **errmsg**: string): integer
vb	function **yPreregisterHub**(ByVal **url** As String, ByRef **errmsg** As String) As Integer
cs	int **PreregisterHub**(string **url**, ref string **errmsg**)
java	int **PreregisterHub**(String **url**)
py	def **PreregisterHub**(**url**, **errmsg**=None)

This function has the same purpose and same arguments as `RegisterHub()`, but does not trigger an error when the selected hub is not available at the time of the function call. This makes it possible to register a network hub independently of the current connectivity, and to try to contact it only when a device is actively needed.

Parameters :

url a string containing either **"usb"**,**"callback"** or the root URL of the hub to monitor

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.RegisterDeviceArrivalCallback() yRegisterDeviceArrivalCallback() YAPI

Register a callback function, to be called each time a device is plugged.

js	function **yRegisterDeviceArrivalCallback**(**arrivalCallback**)
nodejs	function **RegisterDeviceArrivalCallback**(**arrivalCallback**)
php	function **yRegisterDeviceArrivalCallback**(**$arrivalCallback**)
cpp	void **yRegisterDeviceArrivalCallback**(yDeviceUpdateCallback **arrivalCallback**)
m	+(void) **RegisterDeviceArrivalCallback** :(yDeviceUpdateCallback) **arrivalCallback**
pas	procedure **yRegisterDeviceArrivalCallback**(**arrivalCallback**: yDeviceUpdateFunc)
vb	procedure **yRegisterDeviceArrivalCallback**(ByVal **arrivalCallback** As yDeviceUpdateFunc)
cs	void **RegisterDeviceArrivalCallback**(yDeviceUpdateFunc **arrivalCallback**)
java	void **RegisterDeviceArrivalCallback**(DeviceArrivalCallback **arrivalCallback**)
py	def **RegisterDeviceArrivalCallback**(**arrivalCallback**)

This callback will be invoked while `yUpdateDeviceList` is running. You will have to call this function on a regular basis.

Parameters :

arrivalCallback a procedure taking a `YModule` parameter, or `null`

YAPI.RegisterDeviceRemovalCallback() yRegisterDeviceRemovalCallback() YAPI

Register a callback function, to be called each time a device is unplugged.

js	function **yRegisterDeviceRemovalCallback**(**removalCallback**)
nodejs	function **RegisterDeviceRemovalCallback**(**removalCallback**)
php	function **yRegisterDeviceRemovalCallback**(**$removalCallback**)
cpp	void **yRegisterDeviceRemovalCallback**(yDeviceUpdateCallback **removalCallback**)
m	+(void) **RegisterDeviceRemovalCallback** :(yDeviceUpdateCallback) **removalCallback**
pas	procedure **yRegisterDeviceRemovalCallback**(**removalCallback**: yDeviceUpdateFunc)
vb	procedure **yRegisterDeviceRemovalCallback**(ByVal **removalCallback** As yDeviceUpdateFunc)
cs	void **RegisterDeviceRemovalCallback**(yDeviceUpdateFunc **removalCallback**)
java	void **RegisterDeviceRemovalCallback**(DeviceRemovalCallback **removalCallback**)
py	def **RegisterDeviceRemovalCallback**(**removalCallback**)

This callback will be invoked while `yUpdateDeviceList` is running. You will have to call this function on a regular basis.

Parameters :

removalCallback a procedure taking a `YModule` parameter, or `null`

YAPI.RegisterHub() yRegisterHub() YAPI

Setup the Yoctopuce library to use modules connected on a given machine.

js	function **yRegisterHub**(**url**, **errmsg**)
nodejs	function **RegisterHub**(**url**, **errmsg**)
php	function **yRegisterHub**(**$url**, **&$errmsg**)
cpp	YRETCODE **yRegisterHub**(const string& **url**, string& **errmsg**)
m	+(YRETCODE) **RegisterHub** :(NSString *) **url** :(NSError**) **errmsg**
pas	function **yRegisterHub**(**url**: string, var **errmsg**: string): integer
vb	function **yRegisterHub**(ByVal **url** As String, ByRef **errmsg** As String) As Integer
cs	int **RegisterHub**(string **url**, ref string **errmsg**)
java	int **RegisterHub**(String **url**)
py	def **RegisterHub**(**url**, **errmsg**=None)

The parameter will determine how the API will work. Use the following values:

usb: When the **usb** keyword is used, the API will work with devices connected directly to the USB bus. Some programming languages such a Javascript, PHP, and Java don't provide direct access to USB hardware, so **usb** will not work with these. In this case, use a VirtualHub or a networked YoctoHub (see below).

x.x.x.x or ***hostname***: The API will use the devices connected to the host with the given IP address or hostname. That host can be a regular computer running a VirtualHub, or a networked YoctoHub such as YoctoHub-Ethernet or YoctoHub-Wireless. If you want to use the VirtualHub running on you local computer, use the IP address 127.0.0.1.

callback: that keyword make the API run in "*HTTP Callback*" mode. This a special mode allowing to take control of Yoctopuce devices through a NAT filter when using a VirtualHub or a networked YoctoHub. You only need to configure your hub to call your server script on a regular basis. This mode is currently available for PHP and Node.JS only.

Be aware that only one application can use direct USB access at a given time on a machine. Multiple access would cause conflicts while trying to access the USB modules. In particular, this means that you must stop the VirtualHub software before starting an application that uses direct USB access. The workaround for this limitation is to setup the library to use the VirtualHub rather than direct USB access.

If access control has been activated on the hub, virtual or not, you want to reach, the URL parameter should look like:

```
http://username:password@address:port
```

You can call *RegisterHub* several times to connect to several machines.

Parameters :

url a string containing either **"usb"**,**"callback"** or the root URL of the hub to monitor

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.RegisterHubDiscoveryCallback() yRegisterHubDiscoveryCallback() YAPI

Register a callback function, to be called each time an Network Hub send an SSDP message.

cpp	void **yRegisterHubDiscoveryCallback**(YHubDiscoveryCallback **hubDiscoveryCallback**)
m	+(void) **RegisterHubDiscoveryCallback** : (YHubDiscoveryCallback) **hubDiscoveryCallback**
pas	procedure **yRegisterHubDiscoveryCallback**(**hubDiscoveryCallback**: YHubDiscoveryCallback)
vb	procedure **yRegisterHubDiscoveryCallback**(ByVal **hubDiscoveryCallback** As YHubDiscoveryCallback)
cs	void **RegisterHubDiscoveryCallback**(YHubDiscoveryCallback **hubDiscoveryCallback**)
java	void **RegisterHubDiscoveryCallback**(HubDiscoveryCallback **hubDiscoveryCallback**)
py	def **RegisterHubDiscoveryCallback**(**hubDiscoveryCallback**)

The callback has two string parameter, the first one contain the serial number of the hub and the second contain the URL of the network hub (this URL can be passed to RegisterHub). This callback will be invoked while yUpdateDeviceList is running. You will have to call this function on a regular basis.

Parameters :

hubDiscoveryCallback a procedure taking two string parameter, or null

YAPI.RegisterLogFunction() yRegisterLogFunction() YAPI

Registers a log callback function.

cpp	void **yRegisterLogFunction**(yLogFunction **logfun**)
m	+(void) **RegisterLogFunction** :(yLogCallback) **logfun**
pas	procedure **yRegisterLogFunction**(**logfun**: yLogFunc)
vb	procedure **yRegisterLogFunction**(ByVal **logfun** As yLogFunc)
cs	void **RegisterLogFunction**(yLogFunc **logfun**)
java	void **RegisterLogFunction**(LogCallback **logfun**)
py	def **RegisterLogFunction**(**logfun**)

This callback will be called each time the API have something to say. Quite useful to debug the API.

Parameters :

logfun a procedure taking a string parameter, or `null`

YAPI.SelectArchitecture() ySelectArchitecture() — YAPI

Select the architecture or the library to be loaded to access to USB.

py	def **SelectArchitecture**(**arch**)

By default, the Python library automatically detects the appropriate library to use. However, for Linux ARM, it not possible to reliably distinguish between a Hard Float (armhf) and a Soft Float (armel) install. For in this case, it is therefore recommended to manually select the proper architecture by calling `SelectArchitecture()` before any other call to the library.

Parameters :

arch A string containing the architecture to use. Possibles value are: `"armhf"`,`"armel"`, `"i386"`,`"x86_64"`,`"32bit"`, `"64bit"`

Returns :

nothing.

On failure, throws an exception.

YAPI.SetDelegate() ySetDelegate() YAPI

(Objective-C only) Register an object that must follow the protocol `YDeviceHotPlug`.

m	+(void) **SetDelegate** :(id) **object**

The methods `yDeviceArrival` and `yDeviceRemoval` will be invoked while `yUpdateDeviceList` is running. You will have to call this function on a regular basis.

Parameters :

object an object that must follow the protocol `YAPIDelegate`, or `nil`

YAPI.SetTimeout() ySetTimeout() — YAPI

Invoke the specified callback function after a given timeout.

js	function **ySetTimeout**(**callback**, **ms_timeout**, **arguments**)
nodejs	function **SetTimeout**(**callback**, **ms_timeout**, **arguments**)

This function behaves more or less like Javascript `setTimeout`, but during the waiting time, it will call `yHandleEvents` and `yUpdateDeviceList` periodically, in order to keep the API up-to-date with current devices.

Parameters :

- **callback** the function to call after the timeout occurs. On Microsoft Internet Explorer, the callback must be provided as a string to be evaluated.
- **ms_timeout** an integer corresponding to the duration of the timeout, in milliseconds.
- **arguments** additional arguments to be passed to the callback function can be provided, if needed (not supported on Microsoft Internet Explorer).

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.Sleep() ySleep()

YAPI

Pauses the execution flow for a specified duration.

js	function **ySleep**(**ms_duration**, **errmsg**)
nodejs	function **Sleep**(**ms_duration**, **errmsg**)
php	function **ySleep**(**$ms_duration**, **&$errmsg**)
cpp	YRETCODE **ySleep**(unsigned **ms_duration**, string& **errmsg**)
m	+(YRETCODE) **Sleep** :(unsigned) **ms_duration** :(NSError **) **errmsg**
pas	function **ySleep**(**ms_duration**: integer, var **errmsg**: string): integer
vb	function **ySleep**(ByVal **ms_duration** As Integer, ByRef **errmsg** As String) As Integer
cs	int **Sleep**(int **ms_duration**, ref string **errmsg**)
java	int **Sleep**(long **ms_duration**)
py	def **Sleep**(**ms_duration**, **errmsg**=None)

This function implements a passive waiting loop, meaning that it does not consume CPU cycles significantly. The processor is left available for other threads and processes. During the pause, the library nevertheless reads from time to time information from the Yoctopuce modules by calling `yHandleEvents()`, in order to stay up-to-date.

This function may signal an error in case there is a communication problem while contacting a module.

Parameters :

ms_duration an integer corresponding to the duration of the pause, in milliseconds.

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.TriggerHubDiscovery() yTriggerHubDiscovery() YAPI

Force a hub discovery, if a callback as been registered with `yRegisterDeviceRemovalCallback` it will be called for each net work hub that will respond to the discovery.

cpp	YRETCODE **yTriggerHubDiscovery**(string& **errmsg**)
m	+(YRETCODE) **TriggerHubDiscovery** : (NSError**) **errmsg**
pas	function **yTriggerHubDiscovery**(var **errmsg**: string): integer
vb	function **yTriggerHubDiscovery**(ByRef **errmsg** As String) As Integer
cs	int **TriggerHubDiscovery**(ref string **errmsg**)
java	int **TriggerHubDiscovery**( )
py	def **TriggerHubDiscovery**(**errmsg**=None)

Parameters :

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds. On failure, throws an exception or returns a negative error code.

YAPI.UnregisterHub() yUnregisterHub() — YAPI

Setup the Yoctopuce library to no more use modules connected on a previously registered machine with RegisterHub.

js	function **yUnregisterHub**(**url**)
nodejs	function **UnregisterHub**(**url**)
php	function **yUnregisterHub**(**$url**)
cpp	void **yUnregisterHub**(const string& **url**)
m	+(void) **UnregisterHub** :(NSString *) **url**
pas	procedure **yUnregisterHub**(**url**: string)
vb	procedure **yUnregisterHub**(ByVal **url** As String)
cs	void **UnregisterHub**(string **url**)
java	void **UnregisterHub**(String **url**)
py	def **UnregisterHub**(**url**)

Parameters :

url a string containing either **"usb"** or the

YAPI.UpdateDeviceList() yUpdateDeviceList() YAPI

Triggers a (re)detection of connected Yoctopuce modules.

js	function **yUpdateDeviceList**(**errmsg**)
nodejs	function **UpdateDeviceList**(**errmsg**)
php	function **yUpdateDeviceList**(**&$errmsg**)
cpp	YRETCODE **yUpdateDeviceList**(string& **errmsg**)
m	+(YRETCODE) **UpdateDeviceList** :(NSError**) **errmsg**
pas	function **yUpdateDeviceList**(var **errmsg**: string): integer
vb	function **yUpdateDeviceList**(ByRef **errmsg** As String) As YRETCODE
cs	YRETCODE **UpdateDeviceList**(ref string **errmsg**)
java	int **UpdateDeviceList**( )
py	def **UpdateDeviceList**(**errmsg**=None)

The library searches the machines or USB ports previously registered using `yRegisterHub()`, and invokes any user-defined callback function in case a change in the list of connected devices is detected.

This function can be called as frequently as desired to refresh the device list and to make the application aware of hot-plug events.

Parameters :

errmsg a string passed by reference to receive any error message.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

YAPI.UpdateDeviceList_async() yUpdateDeviceList_async() — YAPI

Triggers a (re)detection of connected Yoctopuce modules.

js	function **yUpdateDeviceList_async**(**callback**, **context**)
nodejs	function **UpdateDeviceList_async**(**callback**, **context**)

The library searches the machines or USB ports previously registered using `yRegisterHub()`, and invokes any user-defined callback function in case a change in the list of connected devices is detected.

This function can be called as frequently as desired to refresh the device list and to make the application aware of hot-plug events.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox Javascript VM that does not implement context switching during blocking I/O calls.

Parameters :

- **callback** callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the result code (`YAPI_SUCCESS` if the operation completes successfully) and the error message.
- **context** caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

19.2. Module control interface

This interface is identical for all Yoctopuce USB modules. It can be used to control the module global parameters, and to enumerate the functions provided by each module.

In order to use the functions described here, you should include:

js	<script type='text/javascript' src='yocto_api.js'></script>

nodejs	var yoctolib = require('yoctolib');
	var YAPI = yoctolib.YAPI;
	var YModule = yoctolib.YModule;

php	require_once('yocto_api.php');
cpp	#include "yocto_api.h"
m	#import "yocto_api.h"
pas	uses yocto_api;
vb	yocto_api.vb
cs	yocto_api.cs
java	import com.yoctopuce.YoctoAPI.YModule;
py	from yocto_api import *

Global functions

yFindModule(func)
Allows you to find a module from its serial number or from its logical name.

yFirstModule()
Starts the enumeration of modules currently accessible.

YModule methods

module→checkFirmware(path, onlynew)
Test if the byn file is valid for this module.

module→describe()
Returns a descriptive text that identifies the module.

module→download(pathname)
Downloads the specified built-in file and returns a binary buffer with its content.

module→functionCount()
Returns the number of functions (beside the "module" interface) available on the module.

module→functionId(functionIndex)
Retrieves the hardware identifier of the *n*th function on the module.

module→functionName(functionIndex)
Retrieves the logical name of the *n*th function on the module.

module→functionValue(functionIndex)
Retrieves the advertised value of the *n*th function on the module.

module→get_allSettings()
Returns all the setting of the module.

module→get_beacon()
Returns the state of the localization beacon.

module→get_errorMessage()
Returns the error message of the latest error with this module object.

module→get_errorType()
Returns the numerical error code of the latest error with this module object.

module→get_firmwareRelease()

Returns the version of the firmware embedded in the module.

module→get_hardwareId()

Returns the unique hardware identifier of the module.

module→get_icon2d()

Returns the icon of the module.

module→get_lastLogs()

Returns a string with last logs of the module.

module→get_logicalName()

Returns the logical name of the module.

module→get_luminosity()

Returns the luminosity of the module informative leds (from 0 to 100).

module→get_persistentSettings()

Returns the current state of persistent module settings.

module→get_productId()

Returns the USB device identifier of the module.

module→get_productName()

Returns the commercial name of the module, as set by the factory.

module→get_productRelease()

Returns the hardware release version of the module.

module→get_rebootCountdown()

Returns the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled.

module→get_serialNumber()

Returns the serial number of the module, as set by the factory.

module→get_upTime()

Returns the number of milliseconds spent since the module was powered on.

module→get_usbCurrent()

Returns the current consumed by the module on the USB bus, in milli-amps.

module→get_userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

module→get_userVar()

Returns the value previously stored in this attribute.

module→isOnline()

Checks if the module is currently reachable, without raising any error.

module→isOnline_async(callback, context)

Checks if the module is currently reachable, without raising any error.

module→load(msValidity)

Preloads the module cache with a specified validity duration.

module→load_async(msValidity, callback, context)

Preloads the module cache with a specified validity duration (asynchronous version).

module→nextModule()

Continues the module enumeration started using `yFirstModule()`.

module→reboot(secBeforeReboot)

Schedules a simple module reboot after the given number of seconds.

module→registerLogCallback(callback)

Registers a device log callback function.

module→revertFromFlash()

Reloads the settings stored in the nonvolatile memory, as when the module is powered on.

module→saveToFlash()

Saves current settings in the nonvolatile memory of the module.

module→set_allSettings(settings)

Restore all the setting of the module.

module→set_beacon(newval)

Turns on or off the module localization beacon.

module→set_logicalName(newval)

Changes the logical name of the module.

module→set_luminosity(newval)

Changes the luminosity of the module informative leds.

module→set_userData(data)

Stores a user context provided as argument in the userData attribute of the function.

module→set_userVar(newval)

Returns the value previously stored in this attribute.

module→triggerFirmwareUpdate(secBeforeReboot)

Schedules a module reboot into special firmware update mode.

module→updateFirmware(path)

Prepare a firmware upgrade of the module.

module→wait_async(callback, context)

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

YModule.FindModule() yFindModule()

YModule

Allows you to find a module from its serial number or from its logical name.

js	function **yFindModule**(**func**)
nodejs	function **FindModule**(**func**)
php	function **yFindModule**(**$func**)
cpp	YModule* **yFindModule**(string **func**)
m	+(YModule*) **FindModule** : (NSString*) **func**
pas	function **yFindModule**(**func**: string): TYModule
vb	function **yFindModule**(ByVal **func** As String) As YModule
cs	YModule **FindModule**(string **func**)
java	YModule **FindModule**(String **func**)
py	def **FindModule**(**func**)

This function does not require that the module is online at the time it is invoked. The returned object is nevertheless valid. Use the method `YModule.isOnline()` to test if the module is indeed online at a given time. In case of ambiguity when looking for a module by logical name, no error is notified: the first instance found is returned. The search is performed first by hardware name, then by logical name.

Parameters :

func a string containing either the serial number or the logical name of the desired module

Returns :

a `YModule` object allowing you to drive the module or get additional information on the module.

YModule.FirstModule() yFirstModule()

YModule

Starts the enumeration of modules currently accessible.

js	function **yFirstModule**( )
nodejs	function **FirstModule**( )
php	function **yFirstModule**( )
cpp	YModule* **yFirstModule**( )
m	+(YModule*) **FirstModule**
pas	function **yFirstModule**( ): TYModule
vb	function **yFirstModule**( ) As YModule
cs	YModule **FirstModule**( )
java	YModule **FirstModule**( )
py	def **FirstModule**( )

Use the method `YModule.nextModule()` to iterate on the next modules.

Returns :

a pointer to a `YModule` object, corresponding to the first module currently online, or a `null` pointer if there are none.

module→checkFirmware() YModule

Test if the byn file is valid for this module.

js	function **checkFirmware**(**path**, **onlynew**)
nodejs	function **checkFirmware**(**path**, **onlynew**)
cpp	string **checkFirmware**(string **path**, bool **onlynew**)
m	-(NSString*) **checkFirmware** : (NSString*) **path** : (bool) **onlynew**
pas	function **checkFirmware**(**path**: string, **onlynew**: boolean): string
vb	function **checkFirmware**( ) As String
cs	string **checkFirmware**(string **path**, bool **onlynew**)
java	String **checkFirmware**(String **path**, boolean **onlynew**)
py	def **checkFirmware**(**path**, **onlynew**)
cmd	YModule **target** **checkFirmware** **path** **onlynew**

This method is useful to test if the module need to be updated. It's possible to pass an directory instead of a file. In this case this method return the path of the most recent appropriate byn file. If the parameter onlynew is true the function will discard firmware that are older or equal to the installed firmware.

Parameters :

path the path of a byn file or a directory that contain byn files

onlynew return only files that are strictly newer

Returns :

: the path of the byn file to use or a empty string if no byn files match the requirement

On failure, throws an exception or returns a string that start with "error:".

module→describe() YModule

Returns a descriptive text that identifies the module.

js	function **describe**( )
nodejs	function **describe**( )
php	function **describe**( )
cpp	string **describe**( )
m	-(NSString*) **describe**
pas	function **describe**( ): string
vb	function **describe**( ) As String
cs	string **describe**( )
java	String **describe**( )
py	def **describe**( )

The text may include either the logical name or the serial number of the module.

Returns :
a string that describes the module

module→download() YModule

Downloads the specified built-in file and returns a binary buffer with its content.

js	function **download**(**pathname**)
nodejs	function **download**(**pathname**)
php	function **download**(**$pathname**)
cpp	string **download**(string **pathname**)
m	-(NSMutableData*) **download** : (NSString*) **pathname**
pas	function **download**(**pathname**: string): TByteArray
vb	function **download**( ) As Byte
py	def **download**(**pathname**)
cmd	YModule **target** **download** **pathname**

Parameters :

pathname name of the new file to load

Returns :

a binary buffer with the file content

On failure, throws an exception or returns `YAPI_INVALID_STRING`.

module→functionCount() YModule

Returns the number of functions (beside the "module" interface) available on the module.

js	function **functionCount**( )
nodejs	function **functionCount**( )
php	function **functionCount**( )
cpp	int **functionCount**( )
m	-(int) **functionCount**
pas	function **functionCount**( ): integer
vb	function **functionCount**( ) As Integer
cs	int **functionCount**( )
py	def **functionCount**( )

Returns :
the number of functions on the module

On failure, throws an exception or returns a negative error code.

module→functionId() YModule

Retrieves the hardware identifier of the *n*th function on the module.

js	function **functionId**(**functionIndex**)
nodejs	function **functionId**(**functionIndex**)
php	function **functionId**(**$functionIndex**)
cpp	string **functionId**(int **functionIndex**)
m	-(NSString*) **functionId** : (int) **functionIndex**
pas	function **functionId**(**functionIndex**: integer): string
vb	function **functionId**(ByVal **functionIndex** As Integer) As String
cs	string **functionId**(int **functionIndex**)
py	def **functionId**(**functionIndex**)

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a string corresponding to the unambiguous hardware identifier of the requested module function

On failure, throws an exception or returns an empty string.

module→functionName() YModule

Retrieves the logical name of the *n*th function on the module.

js	function **functionName**(**functionIndex**)
nodejs	function **functionName**(**functionIndex**)
php	function **functionName**(**$functionIndex**)
cpp	string **functionName**(int **functionIndex**)
m	-(NSString*) **functionName** : (int) **functionIndex**
pas	function **functionName**(**functionIndex**: integer): string
vb	function **functionName**(ByVal **functionIndex** As Integer) As String
cs	string **functionName**(int **functionIndex**)
py	def **functionName**(**functionIndex**)

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a string corresponding to the logical name of the requested module function

On failure, throws an exception or returns an empty string.

module→functionValue() YModule

Retrieves the advertised value of the *n*th function on the module.

js	function **functionValue**(**functionIndex**)
nodejs	function **functionValue**(**functionIndex**)
php	function **functionValue**(**$functionIndex**)
cpp	string **functionValue**(int **functionIndex**)
m	-(NSString*) **functionValue** : (int) **functionIndex**
pas	function **functionValue**(**functionIndex**: integer): string
vb	function **functionValue**(ByVal **functionIndex** As Integer) As String
cs	string **functionValue**(int **functionIndex**)
py	def **functionValue**(**functionIndex**)

Parameters :

functionIndex the index of the function for which the information is desired, starting at 0 for the first function.

Returns :

a short string (up to 6 characters) corresponding to the advertised value of the requested module function

On failure, throws an exception or returns an empty string.

module→get_allSettings() module→allSettings() YModule

Returns all the setting of the module.

js	function **get_allSettings**( )
nodejs	function **get_allSettings**( )
php	function **get_allSettings**( )
cpp	string **get_allSettings**( )
m	-(NSMutableData*) allSettings
pas	function **get_allSettings**( ): TByteArray
vb	function **get_allSettings**( ) As Byte
py	def **get_allSettings**( )
cmd	YModule **target** **get_allSettings**

Useful to backup all the logical name and calibrations parameters of a connected module.

Returns :
a binary buffer with all settings.

On failure, throws an exception or returns `YAPI_INVALID_STRING`.

module→get_beacon() module→beacon()

YModule

Returns the state of the localization beacon.

js	function **get_beacon**( )
nodejs	function **get_beacon**( )
php	function **get_beacon**( )
cpp	Y_BEACON_enum **get_beacon**( )
m	-(Y_BEACON_enum) beacon
pas	function **get_beacon**( ): Integer
vb	function **get_beacon**( ) As Integer
cs	int **get_beacon**( )
java	int **get_beacon**( )
py	def **get_beacon**( )
cmd	YModule **target** **get_beacon**

Returns :

either `Y_BEACON_OFF` or `Y_BEACON_ON`, according to the state of the localization beacon

On failure, throws an exception or returns `Y_BEACON_INVALID`.

module→get_errorMessage() module→errorMessage() YModule

Returns the error message of the latest error with this module object.

js	function **get_errorMessage**( )
nodejs	function **get_errorMessage**( )
php	function **get_errorMessage**( )
cpp	string **get_errorMessage**( )
m	-(NSString*) errorMessage
pas	function **get_errorMessage**( ): string
vb	function **get_errorMessage**( ) As String
cs	string **get_errorMessage**( )
java	String **get_errorMessage**( )
py	def **get_errorMessage**( )

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a string corresponding to the latest error message that occured while using this module object

module→get_errorType() module→errorType()

YModule

Returns the numerical error code of the latest error with this module object.

js	function **get_errorType**( )
nodejs	function **get_errorType**( )
php	function **get_errorType**( )
cpp	YRETCODE **get_errorType**( )
pas	function **get_errorType**( ): YRETCODE
vb	function **get_errorType**( ) As YRETCODE
cs	YRETCODE **get_errorType**( )
java	int **get_errorType**( )
py	def **get_errorType**( )

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :

a number corresponding to the code of the latest error that occured while using this module object

module→get_firmwareRelease() module→firmwareRelease()

YModule

Returns the version of the firmware embedded in the module.

js	function **get_firmwareRelease**( )
nodejs	function **get_firmwareRelease**( )
php	function **get_firmwareRelease**( )
cpp	string **get_firmwareRelease**( )
m	-(NSString*) firmwareRelease
pas	function **get_firmwareRelease**( ): string
vb	function **get_firmwareRelease**( ) As String
cs	string **get_firmwareRelease**( )
java	String **get_firmwareRelease**( )
py	def **get_firmwareRelease**( )
cmd	YModule **target** **get_firmwareRelease**

Returns :
a string corresponding to the version of the firmware embedded in the module

On failure, throws an exception or returns `Y_FIRMWARERELEASE_INVALID`.

module→get_hardwareId() module→hardwareId() YModule

Returns the unique hardware identifier of the module.

`js`	function **get_hardwareId**( )
`nodejs`	function **get_hardwareId**( )
`php`	function **get_hardwareId**( )
`cpp`	string **get_hardwareId**( )
`m`	-(NSString*) hardwareId
`vb`	function **get_hardwareId**( ) As String
`cs`	string **get_hardwareId**( )
`java`	String **get_hardwareId**( )
`py`	def **get_hardwareId**( )

The unique hardware identifier is made of the device serial number followed by string ".module".

Returns :
a string that uniquely identifies the module

module→get_icon2d() module→icon2d() YModule

Returns the icon of the module.

js	function **get_icon2d**( )
nodejs	function **get_icon2d**( )
php	function **get_icon2d**( )
cpp	string **get_icon2d**( )
m	-(NSMutableData*) icon2d
pas	function **get_icon2d**( ): TByteArray
vb	function **get_icon2d**( ) As Byte
py	def **get_icon2d**( )
cmd	YModule **target** **get_icon2d**

The icon is a PNG image and does not exceeds 1536 bytes.

Returns :
a binary buffer with module icon, in png format. On failure, throws an exception or returns `YAPI_INVALID_STRING`.

module→get_lastLogs() module→lastLogs() YModule

Returns a string with last logs of the module.

js	function **get_lastLogs**( )
nodejs	function **get_lastLogs**( )
php	function **get_lastLogs**( )
cpp	string **get_lastLogs**( )
m	-(NSString*) lastLogs
pas	function **get_lastLogs**( ): string
vb	function **get_lastLogs**( ) As String
cs	string **get_lastLogs**( )
java	String **get_lastLogs**( )
py	def **get_lastLogs**( )
cmd	YModule **target** **get_lastLogs**

This method return only logs that are still in the module.

Returns :
a string with last logs of the module. On failure, throws an exception or returns `YAPI_INVALID_STRING`.

module→get_logicalName() module→logicalName() YModule

Returns the logical name of the module.

js	function **get_logicalName**( )
nodejs	function **get_logicalName**( )
php	function **get_logicalName**( )
cpp	string **get_logicalName**( )
m	-(NSString*) logicalName
pas	function **get_logicalName**( ): string
vb	function **get_logicalName**( ) As String
cs	string **get_logicalName**( )
java	String **get_logicalName**( )
py	def **get_logicalName**( )
cmd	YModule **target** **get_logicalName**

Returns :
a string corresponding to the logical name of the module

On failure, throws an exception or returns `Y_LOGICALNAME_INVALID`.

module→get_luminosity() module→luminosity() YModule

Returns the luminosity of the module informative leds (from 0 to 100).

js	function **get_luminosity**( )
nodejs	function **get_luminosity**( )
php	function **get_luminosity**( )
cpp	int **get_luminosity**( )
m	-(int) luminosity
pas	function **get_luminosity**( ): LongInt
vb	function **get_luminosity**( ) As Integer
cs	int **get_luminosity**( )
java	int **get_luminosity**( )
py	def **get_luminosity**( )
cmd	YModule **target** **get_luminosity**

Returns :

an integer corresponding to the luminosity of the module informative leds (from 0 to 100)

On failure, throws an exception or returns `Y_LUMINOSITY_INVALID`.

module→get_persistentSettings() module→persistentSettings() YModule

Returns the current state of persistent module settings.

js	function **get_persistentSettings**( )
nodejs	function **get_persistentSettings**( )
php	function **get_persistentSettings**( )
cpp	Y_PERSISTENTSETTINGS_enum **get_persistentSettings**( )
m	-(Y_PERSISTENTSETTINGS_enum) persistentSettings
pas	function **get_persistentSettings**( ): Integer
vb	function **get_persistentSettings**( ) As Integer
cs	int **get_persistentSettings**( )
java	int **get_persistentSettings**( )
py	def **get_persistentSettings**( )
cmd	YModule **target** **get_persistentSettings**

Returns :

a value among `Y_PERSISTENTSETTINGS_LOADED`, `Y_PERSISTENTSETTINGS_SAVED` and `Y_PERSISTENTSETTINGS_MODIFIED` corresponding to the current state of persistent module settings

On failure, throws an exception or returns `Y_PERSISTENTSETTINGS_INVALID`.

module→get_productId() module→productId() YModule

Returns the USB device identifier of the module.

js	function **get_productId**( )
nodejs	function **get_productId**( )
php	function **get_productId**( )
cpp	int **get_productId**( )
m	-(int) productId
pas	function **get_productId**( ): LongInt
vb	function **get_productId**( ) As Integer
cs	int **get_productId**( )
java	int **get_productId**( )
py	def **get_productId**( )
cmd	YModule **target** **get_productId**

Returns :
an integer corresponding to the USB device identifier of the module

On failure, throws an exception or returns `Y_PRODUCTID_INVALID`.

module→get_productName() module→productName()

YModule

Returns the commercial name of the module, as set by the factory.

js	function **get_productName**( )
nodejs	function **get_productName**( )
php	function **get_productName**( )
cpp	string **get_productName**( )
m	-(NSString*) productName
pas	function **get_productName**( ): string
vb	function **get_productName**( ) As String
cs	string **get_productName**( )
java	String **get_productName**( )
py	def **get_productName**( )
cmd	YModule **target** **get_productName**

Returns :

a string corresponding to the commercial name of the module, as set by the factory

On failure, throws an exception or returns `Y_PRODUCTNAME_INVALID`.

module→get_productRelease() module→productRelease() YModule

Returns the hardware release version of the module.

js	function **get_productRelease**( )
nodejs	function **get_productRelease**( )
php	function **get_productRelease**( )
cpp	int **get_productRelease**( )
m	-(int) productRelease
pas	function **get_productRelease**( ): LongInt
vb	function **get_productRelease**( ) As Integer
cs	int **get_productRelease**( )
java	int **get_productRelease**( )
py	def **get_productRelease**( )
cmd	YModule **target** **get_productRelease**

Returns :
an integer corresponding to the hardware release version of the module

On failure, throws an exception or returns `Y_PRODUCTRELEASE_INVALID`.

module→get_rebootCountdown() module→rebootCountdown() YModule

Returns the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled.

js	function **get_rebootCountdown**( )
nodejs	function **get_rebootCountdown**( )
php	function **get_rebootCountdown**( )
cpp	int **get_rebootCountdown**( )
m	-(int) rebootCountdown
pas	function **get_rebootCountdown**( ): LongInt
vb	function **get_rebootCountdown**( ) As Integer
cs	int **get_rebootCountdown**( )
java	int **get_rebootCountdown**( )
py	def **get_rebootCountdown**( )
cmd	YModule **target** **get_rebootCountdown**

Returns :

an integer corresponding to the remaining number of seconds before the module restarts, or zero when no reboot has been scheduled

On failure, throws an exception or returns `Y_REBOOTCOUNTDOWN_INVALID`.

module→get_serialNumber() module→serialNumber() YModule

Returns the serial number of the module, as set by the factory.

js	function **get_serialNumber**( )
nodejs	function **get_serialNumber**( )
php	function **get_serialNumber**( )
cpp	string **get_serialNumber**( )
m	-(NSString*) serialNumber
pas	function **get_serialNumber**( ): string
vb	function **get_serialNumber**( ) As String
cs	string **get_serialNumber**( )
java	String **get_serialNumber**( )
py	def **get_serialNumber**( )
cmd	YModule **target** **get_serialNumber**

Returns :
a string corresponding to the serial number of the module, as set by the factory

On failure, throws an exception or returns `Y_SERIALNUMBER_INVALID`.

module→get_upTime() module→upTime()

YModule

Returns the number of milliseconds spent since the module was powered on.

js	function **get_upTime**( )
nodejs	function **get_upTime**( )
php	function **get_upTime**( )
cpp	s64 **get_upTime**( )
m	-(s64) upTime
pas	function **get_upTime**( ): int64
vb	function **get_upTime**( ) As Long
cs	long **get_upTime**( )
java	long **get_upTime**( )
py	def **get_upTime**( )
cmd	YModule **target** **get_upTime**

Returns :

an integer corresponding to the number of milliseconds spent since the module was powered on

On failure, throws an exception or returns `Y_UPTIME_INVALID`.

module→get_usbCurrent() module→usbCurrent() YModule

Returns the current consumed by the module on the USB bus, in milli-amps.

js	function **get_usbCurrent**( )
nodejs	function **get_usbCurrent**( )
php	function **get_usbCurrent**( )
cpp	int **get_usbCurrent**( )
m	-(int) usbCurrent
pas	function **get_usbCurrent**( ): LongInt
vb	function **get_usbCurrent**( ) As Integer
cs	int **get_usbCurrent**( )
java	int **get_usbCurrent**( )
py	def **get_usbCurrent**( )
cmd	YModule **target** **get_usbCurrent**

Returns :
an integer corresponding to the current consumed by the module on the USB bus, in milli-amps

On failure, throws an exception or returns `Y_USBCURRENT_INVALID`.

module→get_userData()
module→userData()

YModule

Returns the value of the userData attribute, as previously stored using method `set_userData`.

js	function **get_userData**( )
nodejs	function **get_userData**( )
php	function **get_userData**( )
cpp	void * **get_userData**( )
m	-(void*) userData
pas	function **get_userData**( ): Tobject
vb	function **get_userData**( ) As Object
cs	object **get_userData**( )
java	Object **get_userData**( )
py	def **get_userData**( )

This attribute is never touched directly by the API, and is at disposal of the caller to store a context.

Returns :
the object stored previously by the caller.

module→get_userVar() module→userVar() YModule

Returns the value previously stored in this attribute.

js	function **get_userVar**( )
nodejs	function **get_userVar**( )
php	function **get_userVar**( )
cpp	int **get_userVar**( )
m	-(int) userVar
pas	function **get_userVar**( ): LongInt
vb	function **get_userVar**( ) As Integer
cs	int **get_userVar**( )
java	int **get_userVar**( )
py	def **get_userVar**( )
cmd	YModule **target** **get_userVar**

On startup and after a device reboot, the value is always reset to zero.

Returns :
an integer corresponding to the value previously stored in this attribute

On failure, throws an exception or returns `Y_USERVAR_INVALID`.

module→isOnline() YModule

Checks if the module is currently reachable, without raising any error.

`js`	function **isOnline**( )
`nodejs`	function **isOnline**( )
`php`	function **isOnline**( )
`cpp`	bool **isOnline**( )
`m`	-(BOOL) **isOnline**
`pas`	function **isOnline**( ): boolean
`vb`	function **isOnline**( ) As Boolean
`cs`	bool **isOnline**( )
`java`	boolean **isOnline**( )
`py`	def **isOnline**( )

If there are valid cached values for the module, that have not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the requested module.

Returns :

`true` if the module can be reached, and `false` otherwise

module→isOnline_async() YModule

Checks if the module is currently reachable, without raising any error.

```
js      function isOnline_async( callback, context)
nodejs  function isOnline_async( callback, context)
```

If there are valid cached values for the module, that have not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the requested module.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox Javascript VM that does not implement context switching during blocking I/O calls.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving module object and the boolean result

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

module→load() YModule

Preloads the module cache with a specified validity duration.

js	function **load**(**msValidity**)
nodejs	function **load**(**msValidity**)
php	function **load**(**$msValidity**)
cpp	YRETCODE **load**(int **msValidity**)
m	-(YRETCODE) **load** : (int) **msValidity**
pas	function **load**(**msValidity**: integer): YRETCODE
vb	function **load**(ByVal **msValidity** As Integer) As YRETCODE
cs	YRETCODE **load**(int **msValidity**)
java	int **load**(long **msValidity**)
py	def **load**(**msValidity**)

By default, whenever accessing a device, all module attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance.

Parameters :

msValidity an integer corresponding to the validity attributed to the loaded module parameters, in milliseconds

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→load_async() YModule

Preloads the module cache with a specified validity duration (asynchronous version).

js	function **load_async**(**msValidity**, **callback**, **context**)
nodejs	function **load_async**(**msValidity**, **callback**, **context**)

By default, whenever accessing a device, all module attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox javascript VM that does not implement context switching during blocking I/O calls. See the documentation section on asynchronous Javascript calls for more details.

Parameters :

msValidity an integer corresponding to the validity of the loaded module parameters, in milliseconds

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving module object and the error code (or `YAPI_SUCCESS`)

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

module→nextModule() YModule

Continues the module enumeration started using `yFirstModule()`.

js	function **nextModule**( )
nodejs	function **nextModule**( )
php	function **nextModule**( )
cpp	YModule * **nextModule**( )
m	-(YModule*) **nextModule**
pas	function **nextModule**( ): TYModule
vb	function **nextModule**( ) As YModule
cs	YModule **nextModule**( )
java	YModule **nextModule**( )
py	def **nextModule**( )

Returns :

a pointer to a `YModule` object, corresponding to the next module found, or a `null` pointer if there are no more modules to enumerate.

module→reboot() YModule

Schedules a simple module reboot after the given number of seconds.

js	function **reboot**(**secBeforeReboot**)
nodejs	function **reboot**(**secBeforeReboot**)
php	function **reboot**(**$secBeforeReboot**)
cpp	int **reboot**(int **secBeforeReboot**)
m	-(int) **reboot** : (int) **secBeforeReboot**
pas	function **reboot**(**secBeforeReboot**: LongInt): LongInt
vb	function **reboot**( ) As Integer
cs	int **reboot**(int **secBeforeReboot**)
java	int **reboot**(int **secBeforeReboot**)
py	def **reboot**(**secBeforeReboot**)
cmd	YModule **target** **reboot** **secBeforeReboot**

Parameters :

secBeforeReboot number of seconds before rebooting

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→registerLogCallback() YModule

Registers a device log callback function.

cpp	void **registerLogCallback**(YModuleLogCallback **callback**)
m	-(void) **registerLogCallback** : (YModuleLogCallback) **callback**
vb	function **registerLogCallback**(ByVal **callback** As YModuleLogCallback) As Integer
cs	int **registerLogCallback**(LogCallback **callback**)
java	void **registerLogCallback**(LogCallback **callback**)
py	def **registerLogCallback**(**callback**)

This callback will be called each time that a module sends a new log message. Mostly useful to debug a Yoctopuce module.

Parameters :

callback the callback function to call, or a null pointer. The callback function should take two arguments: the module object that emitted the log message, and the character string containing the log.

module→revertFromFlash() YModule

Reloads the settings stored in the nonvolatile memory, as when the module is powered on.

js	function **revertFromFlash**( )
nodejs	function **revertFromFlash**( )
php	function **revertFromFlash**( )
cpp	int **revertFromFlash**( )
m	-(int) **revertFromFlash**
pas	function **revertFromFlash**( ): LongInt
vb	function **revertFromFlash**( ) As Integer
cs	int **revertFromFlash**( )
java	int **revertFromFlash**( )
py	def **revertFromFlash**( )
cmd	YModule **target** **revertFromFlash**

Returns :
`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→saveToFlash() YModule

Saves current settings in the nonvolatile memory of the module.

js	function **saveToFlash**( )
nodejs	function **saveToFlash**( )
php	function **saveToFlash**( )
cpp	int **saveToFlash**( )
m	-(int) **saveToFlash**
pas	function **saveToFlash**( ): LongInt
vb	function **saveToFlash**( ) As Integer
cs	int **saveToFlash**( )
java	int **saveToFlash**( )
py	def **saveToFlash**( )
cmd	YModule **target** **saveToFlash**

Warning: the number of allowed save operations during a module life is limited (about 100000 cycles). Do not call this function within a loop.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_allSettings() module→setAllSettings() YModule

Restore all the setting of the module.

js	function **set_allSettings**(**settings**)
nodejs	function **set_allSettings**(**settings**)
php	function **set_allSettings**(**$settings**)
cpp	int **set_allSettings**(string **settings**)
m	-(int) setAllSettings : (NSData*) **settings**
pas	function **set_allSettings**(**settings**: TByteArray): LongInt
vb	procedure **set_allSettings**( )
cs	int **set_allSettings**( )
java	int **set_allSettings**( )
py	def **set_allSettings**(**settings**)
cmd	YModule **target** **set_allSettings** **settings**

Useful to restore all the logical name and calibrations parameters of a module from a backup.

Parameters :

settings a binary buffer with all settings.

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_beacon()
module→setBeacon()

YModule

Turns on or off the module localization beacon.

js	function **set_beacon**(**newval**)
nodejs	function **set_beacon**(**newval**)
php	function **set_beacon**(**$newval**)
cpp	int **set_beacon**(Y_BEACON_enum **newval**)
m	-(int) setBeacon : (Y_BEACON_enum) **newval**
pas	function **set_beacon**(**newval**: Integer): integer
vb	function **set_beacon**(ByVal **newval** As Integer) As Integer
cs	int **set_beacon**(int **newval**)
java	int **set_beacon**(int **newval**)
py	def **set_beacon**(**newval**)
cmd	YModule **target** **set_beacon** **newval**

Parameters :

newval either `Y_BEACON_OFF` or `Y_BEACON_ON`

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_logicalName() module→setLogicalName()

YModule

Changes the logical name of the module.

js	function **set_logicalName**(**newval**)
nodejs	function **set_logicalName**(**newval**)
php	function **set_logicalName**(**$newval**)
cpp	int **set_logicalName**(const string& **newval**)
m	-(int) setLogicalName : (NSString*) **newval**
pas	function **set_logicalName**(**newval**: string): integer
vb	function **set_logicalName**(ByVal **newval** As String) As Integer
cs	int **set_logicalName**(string **newval**)
java	int **set_logicalName**(String **newval**)
py	def **set_logicalName**(**newval**)
cmd	YModule **target** **set_logicalName** **newval**

You can use `yCheckLogicalName()` prior to this call to make sure that your parameter is valid. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval a string corresponding to the logical name of the module

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_luminosity() module→setLuminosity() YModule

Changes the luminosity of the module informative leds.

js	function **set_luminosity**(**newval**)
nodejs	function **set_luminosity**(**newval**)
php	function **set_luminosity**(**$newval**)
cpp	int **set_luminosity**(int **newval**)
m	-(int) setLuminosity : (int) **newval**
pas	function **set_luminosity**(**newval**: LongInt): integer
vb	function **set_luminosity**(ByVal **newval** As Integer) As Integer
cs	int **set_luminosity**(int **newval**)
java	int **set_luminosity**(int **newval**)
py	def **set_luminosity**(**newval**)
cmd	YModule **target set_luminosity newval**

The parameter is a value between 0 and 100. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval an integer corresponding to the luminosity of the module informative leds

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→set_userData() module→setUserData() YModule

Stores a user context provided as argument in the userData attribute of the function.

js	function **set_userData**(**data**)
nodejs	function **set_userData**(**data**)
php	function **set_userData**(**$data**)
cpp	void **set_userData**(void* **data**)
m	-(void) setUserData : (void*) **data**
pas	procedure **set_userData**(**data**: Tobject)
vb	procedure **set_userData**(ByVal **data** As Object)
cs	void **set_userData**(object **data**)
java	void **set_userData**(Object **data**)
py	def **set_userData**(**data**)

This attribute is never touched by the API, and is at disposal of the caller to store a context.

Parameters :

data any kind of object to be stored

module→set_userVar() module→setUserVar()

YModule

Returns the value previously stored in this attribute.

js	function **set_userVar**(**newval**)
nodejs	function **set_userVar**(**newval**)
php	function **set_userVar**(**$newval**)
cpp	int **set_userVar**(int **newval**)
m	-(int) setUserVar : (int) **newval**
pas	function **set_userVar**(**newval**: LongInt): integer
vb	function **set_userVar**(ByVal **newval** As Integer) As Integer
cs	int **set_userVar**(int **newval**)
java	int **set_userVar**(int **newval**)
py	def **set_userVar**(**newval**)
cmd	YModule **target** **set_userVar** **newval**

On startup and after a device reboot, the value is always reset to zero.

Parameters :

newval an integer

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

module→triggerFirmwareUpdate() YModule

Schedules a module reboot into special firmware update mode.

js	function **triggerFirmwareUpdate**(**secBeforeReboot**)
nodejs	function **triggerFirmwareUpdate**(**secBeforeReboot**)
php	function **triggerFirmwareUpdate**(**$secBeforeReboot**)
cpp	int **triggerFirmwareUpdate**(int **secBeforeReboot**)
m	-(int) **triggerFirmwareUpdate** : (int) **secBeforeReboot**
pas	function **triggerFirmwareUpdate**(**secBeforeReboot**: LongInt): LongInt
vb	function **triggerFirmwareUpdate**( ) As Integer
cs	int **triggerFirmwareUpdate**(int **secBeforeReboot**)
java	int **triggerFirmwareUpdate**(int **secBeforeReboot**)
py	def **triggerFirmwareUpdate**(**secBeforeReboot**)
cmd	YModule **target** **triggerFirmwareUpdate** **secBeforeReboot**

Parameters :

secBeforeReboot number of seconds before rebooting

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

module→updateFirmware() YModule

Prepare a firmware upgrade of the module.

js	function **updateFirmware**(**path**)
nodejs	function **updateFirmware**(**path**)
php	function **updateFirmware**(**$path**)
cpp	YFirmwareUpdate **updateFirmware**(string **path**)
m	-(YFirmwareUpdate*) **updateFirmware** : (NSString*) **path**
pas	function **updateFirmware**(**path**: string): TYFirmwareUpdate
vb	function **updateFirmware**( ) As YFirmwareUpdate
cs	YFirmwareUpdate **updateFirmware**(string **path**)
java	YFirmwareUpdate **updateFirmware**(String **path**)
py	def **updateFirmware**(**path**)
cmd	YModule **target** **updateFirmware** **path**

This method return a object `YFirmwareUpdate` which will handle the firmware upgrade process.

Parameters :

path the path of the byn file to use.

Returns :

: A object `YFirmwareUpdate`.

module→wait_async() YModule

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

```
js      function wait_async( callback, context)
nodejs  function wait_async( callback, context)
```

The callback function can therefore freely issue synchronous or asynchronous commands, without risking to block the Javascript VM.

Parameters :

callback callback function that is invoked when all pending commands on the module are completed. The callback function receives two arguments: the caller-specific context object and the receiving function object.

context caller-specific object that is passed as-is to the callback function

Returns :

nothing.

19.3. Led function interface

Yoctopuce application programming interface allows you not only to drive the intensity of the led, but also to have it blink at various preset frequencies.

In order to use the functions described here, you should include:

js	<script type='text/javascript' src='yocto_led.js'></script>
nodejs	var yoctolib = require('yoctolib'); var YLed = yoctolib.YLed;
php	require_once('yocto_led.php');
cpp	#include "yocto_led.h"
m	#import "yocto_led.h"
pas	uses yocto_led;
vb	yocto_led.vb
cs	yocto_led.cs
java	import com.yoctopuce.YoctoAPI.YLed;
py	from yocto_led import *

Global functions

yFindLed(func)
Retrieves a led for a given identifier.

yFirstLed()
Starts the enumeration of leds currently accessible.

YLed methods

led→describe()
Returns a short text that describes unambiguously the instance of the led in the form `TYPE(NAME)=SERIAL.FUNCTIONID`.

led→get_advertisedValue()
Returns the current value of the led (no more than 6 characters).

led→get_blinking()
Returns the current led signaling mode.

led→get_errorMessage()
Returns the error message of the latest error with the led.

led→get_errorType()
Returns the numerical error code of the latest error with the led.

led→get_friendlyName()
Returns a global identifier of the led in the format `MODULE_NAME.FUNCTION_NAME`.

led→get_functionDescriptor()
Returns a unique identifier of type `YFUN_DESCR` corresponding to the function.

led→get_functionId()
Returns the hardware identifier of the led, without reference to the module.

led→get_hardwareId()
Returns the unique hardware identifier of the led in the form `SERIAL.FUNCTIONID`.

led→get_logicalName()
Returns the logical name of the led.

led→get_luminosity()
Returns the current led intensity (in per cent).

led→get_module()

Gets the `YModule` object for the device on which the function is located.

led→get_module_async(callback, context)

Gets the `YModule` object for the device on which the function is located (asynchronous version).

led→get_power()

Returns the current led state.

led→get_userData()

Returns the value of the userData attribute, as previously stored using method `set_userData`.

led→isOnline()

Checks if the led is currently reachable, without raising any error.

led→isOnline_async(callback, context)

Checks if the led is currently reachable, without raising any error (asynchronous version).

led→load(msValidity)

Preloads the led cache with a specified validity duration.

led→load_async(msValidity, callback, context)

Preloads the led cache with a specified validity duration (asynchronous version).

led→nextLed()

Continues the enumeration of leds started using `yFirstLed()`.

led→registerValueCallback(callback)

Registers the callback function that is invoked on every change of advertised value.

led→set_blinking(newval)

Changes the current led signaling mode.

led→set_logicalName(newval)

Changes the logical name of the led.

led→set_luminosity(newval)

Changes the current led intensity (in per cent).

led→set_power(newval)

Changes the state of the led.

led→set_userData(data)

Stores a user context provided as argument in the userData attribute of the function.

led→wait_async(callback, context)

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

YLed.FindLed() yFindLed() — YLed

Retrieves a led for a given identifier.

js	function **yFindLed**(**func**)
nodejs	function **FindLed**(**func**)
php	function **yFindLed**(**$func**)
cpp	YLed* **yFindLed**(const string& **func**)
m	+(YLed*) **FindLed** :(NSString*) **func**
pas	function **yFindLed**(**func**: string): TYLed
vb	function **yFindLed**(ByVal **func** As String) As YLed
cs	YLed **FindLed**(string **func**)
java	YLed **FindLed**(String **func**)
py	def **FindLed**(**func**)

The identifier can be specified using several formats:

- FunctionLogicalName
- ModuleSerialNumber.FunctionIdentifier
- ModuleSerialNumber.FunctionLogicalName
- ModuleLogicalName.FunctionIdentifier
- ModuleLogicalName.FunctionLogicalName

This function does not require that the led is online at the time it is invoked. The returned object is nevertheless valid. Use the method `YLed.isOnline()` to test if the led is indeed online at a given time. In case of ambiguity when looking for a led by logical name, no error is notified: the first instance found is returned. The search is performed first by hardware name, then by logical name.

Parameters :

func a string that uniquely characterizes the led

Returns :

a `YLed` object allowing you to drive the led.

YLed.FirstLed() yFirstLed() YLed

Starts the enumeration of leds currently accessible.

js	function **yFirstLed**( )
nodejs	function **FirstLed**( )
php	function **yFirstLed**( )
cpp	YLed* **yFirstLed**( )
m	+(YLed*) **FirstLed**
pas	function **yFirstLed**( ): TYLed
vb	function **yFirstLed**( ) As YLed
cs	YLed **FirstLed**( )
java	YLed **FirstLed**( )
py	def **FirstLed**( )

Use the method `YLed.nextLed()` to iterate on next leds.

Returns :

a pointer to a `YLed` object, corresponding to the first led currently online, or a `null` pointer if there are none.

led→describe() YLed

Returns a short text that describes unambiguously the instance of the led in the form TYPE(NAME)=SERIAL.FUNCTIONID.

js	function **describe**( )
nodejs	function **describe**( )
php	function **describe**( )
cpp	string **describe**( )
m	-(NSString*) **describe**
pas	function **describe**( ): string
vb	function **describe**( ) As String
cs	string **describe**( )
java	String **describe**( )
py	def **describe**( )

More precisely, TYPE is the type of the function, NAME it the name used for the first access to the function, SERIAL is the serial number of the module if the module is connected or "unresolved", and FUNCTIONID is the hardware identifier of the function if the module is connected. For example, this method returns Relay(MyCustomName.relay1)=RELAYLO1-123456.relay1 if the module is already connected or Relay(BadCustomeName.relay1)=unresolved if the module has not yet been connected. This method does not trigger any USB or TCP transaction and can therefore be used in a debugger.

Returns :

a string that describes the led (ex: Relay(MyCustomName.relay1)=RELAYLO1-123456.relay1)

led→get_advertisedValue() led→advertisedValue() YLed

Returns the current value of the led (no more than 6 characters).

js	function **get_advertisedValue**( )
nodejs	function **get_advertisedValue**( )
php	function **get_advertisedValue**( )
cpp	string **get_advertisedValue**( )
m	-(NSString*) advertisedValue
pas	function **get_advertisedValue**( ): string
vb	function **get_advertisedValue**( ) As String
cs	string **get_advertisedValue**( )
java	String **get_advertisedValue**( )
py	def **get_advertisedValue**( )
cmd	YLed **target** **get_advertisedValue**

Returns :
a string corresponding to the current value of the led (no more than 6 characters).

On failure, throws an exception or returns `Y_ADVERTISEDVALUE_INVALID`.

led→get_blinking()
led→blinking()

YLed

Returns the current led signaling mode.

js	function **get_blinking**( )
nodejs	function **get_blinking**( )
php	function **get_blinking**( )
cpp	Y_BLINKING_enum **get_blinking**( )
m	-(Y_BLINKING_enum) blinking
pas	function **get_blinking**( ): Integer
vb	function **get_blinking**( ) As Integer
cs	int **get_blinking**( )
java	int **get_blinking**( )
py	def **get_blinking**( )
cmd	YLed **target** **get_blinking**

Returns :

a value among `Y_BLINKING_STILL`, `Y_BLINKING_RELAX`, `Y_BLINKING_AWARE`, `Y_BLINKING_RUN`, `Y_BLINKING_CALL` and `Y_BLINKING_PANIC` corresponding to the current led signaling mode

On failure, throws an exception or returns `Y_BLINKING_INVALID`.

led→get_errorMessage() led→errorMessage()

YLed

Returns the error message of the latest error with the led.

js	function **get_errorMessage**( )
nodejs	function **get_errorMessage**( )
php	function **get_errorMessage**( )
cpp	string **get_errorMessage**( )
m	-(NSString*) errorMessage
pas	function **get_errorMessage**( ): string
vb	function **get_errorMessage**( ) As String
cs	string **get_errorMessage**( )
java	String **get_errorMessage**( )
py	def **get_errorMessage**( )

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :

a string corresponding to the latest error message that occured while using the led object

led→get_errorType() led→errorType() — YLed

Returns the numerical error code of the latest error with the led.

js	function **get_errorType**( )
nodejs	function **get_errorType**( )
php	function **get_errorType**( )
cpp	YRETCODE **get_errorType**( )
pas	function **get_errorType**( ): YRETCODE
vb	function **get_errorType**( ) As YRETCODE
cs	YRETCODE **get_errorType**( )
java	int **get_errorType**( )
py	def **get_errorType**( )

This method is mostly useful when using the Yoctopuce library with exceptions disabled.

Returns :
a number corresponding to the code of the latest error that occurred while using the led object

led→get_friendlyName()
led→friendlyName() YLed

Returns a global identifier of the led in the format `MODULE_NAME.FUNCTION_NAME`.

js	function **get_friendlyName**( )
nodejs	function **get_friendlyName**( )
php	function **get_friendlyName**( )
cpp	string **get_friendlyName**( )
m	-(NSString*) friendlyName
cs	string **get_friendlyName**( )
java	String **get_friendlyName**( )
py	def **get_friendlyName**( )

The returned string uses the logical names of the module and of the led if they are defined, otherwise the serial number of the module and the hardware identifier of the led (for example: `MyCustomName.relay1`)

Returns :

a string that uniquely identifies the led using logical names (ex: `MyCustomName.relay1`)

On failure, throws an exception or returns `Y_FRIENDLYNAME_INVALID`.

led→get_functionDescriptor() led→functionDescriptor() **YLed**

Returns a unique identifier of type YFUN_DESCR corresponding to the function.

js	function **get_functionDescriptor**( )
nodejs	function **get_functionDescriptor**( )
php	function **get_functionDescriptor**( )
cpp	YFUN_DESCR **get_functionDescriptor**( )
m	-(YFUN_DESCR) functionDescriptor
pas	function **get_functionDescriptor**( ): YFUN_DESCR
vb	function **get_functionDescriptor**( ) As YFUN_DESCR
cs	YFUN_DESCR **get_functionDescriptor**( )
java	String **get_functionDescriptor**( )
py	def **get_functionDescriptor**( )

This identifier can be used to test if two instances of YFunction reference the same physical function on the same physical device.

Returns :

an identifier of type YFUN_DESCR.

If the function has never been contacted, the returned value is Y_FUNCTIONDESCRIPTOR_INVALID.

led→get_functionId() led→functionId()

YLed

Returns the hardware identifier of the led, without reference to the module.

js	function **get_functionId**( )
nodejs	function **get_functionId**( )
php	function **get_functionId**( )
cpp	string **get_functionId**( )
m	-(NSString*) functionId
vb	function **get_functionId**( ) As String
cs	string **get_functionId**( )
java	String **get_functionId**( )
py	def **get_functionId**( )

For example `relay1`

Returns :

a string that identifies the led (ex: `relay1`)

On failure, throws an exception or returns `Y_FUNCTIONID_INVALID`.

led→get_hardwareId() led→hardwareId() YLed

Returns the unique hardware identifier of the led in the form SERIAL.FUNCTIONID.

js	function **get_hardwareId**( )
nodejs	function **get_hardwareId**( )
php	function **get_hardwareId**( )
cpp	string **get_hardwareId**( )
m	-(NSString*) hardwareId
vb	function **get_hardwareId**( ) As String
cs	string **get_hardwareId**( )
java	String **get_hardwareId**( )
py	def **get_hardwareId**( )

The unique hardware identifier is composed of the device serial number and of the hardware identifier of the led (for example RELAYLO1-123456.relay1).

Returns :

a string that uniquely identifies the led (ex: RELAYLO1-123456.relay1)

On failure, throws an exception or returns Y_HARDWAREID_INVALID.

led→get_logicalName() led→logicalName() YLed

Returns the logical name of the led.

js	function **get_logicalName**( )
nodejs	function **get_logicalName**( )
php	function **get_logicalName**( )
cpp	string **get_logicalName**( )
m	-(NSString*) logicalName
pas	function **get_logicalName**( ): string
vb	function **get_logicalName**( ) As String
cs	string **get_logicalName**( )
java	String **get_logicalName**( )
py	def **get_logicalName**( )
cmd	YLed **target** **get_logicalName**

Returns :
a string corresponding to the logical name of the led.

On failure, throws an exception or returns `Y_LOGICALNAME_INVALID`.

led→get_luminosity() led→luminosity() YLed

Returns the current led intensity (in per cent).

js	function **get_luminosity**( )
nodejs	function **get_luminosity**( )
php	function **get_luminosity**( )
cpp	int **get_luminosity**( )
m	-(int) luminosity
pas	function **get_luminosity**( ): LongInt
vb	function **get_luminosity**( ) As Integer
cs	int **get_luminosity**( )
java	int **get_luminosity**( )
py	def **get_luminosity**( )
cmd	YLed **target** **get_luminosity**

Returns :

an integer corresponding to the current led intensity (in per cent)

On failure, throws an exception or returns `Y_LUMINOSITY_INVALID`.

led→get_module() led→module() YLed

Gets the `YModule` object for the device on which the function is located.

js	function **get_module**( )
nodejs	function **get_module**( )
php	function **get_module**( )
cpp	YModule * **get_module**( )
m	-(YModule*) module
pas	function **get_module**( ): TYModule
vb	function **get_module**( ) As YModule
cs	YModule **get_module**( )
java	YModule **get_module**( )
py	def **get_module**( )

If the function cannot be located on any module, the returned instance of `YModule` is not shown as on-line.

Returns :

an instance of `YModule`

led→get_module_async() led→module_async() YLed

Gets the YModule object for the device on which the function is located (asynchronous version).

```
js      function get_module_async( callback, context)
nodejs  function get_module_async( callback, context)
```

If the function cannot be located on any module, the returned YModule object does not show as on-line.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking Firefox javascript VM that does not implement context switching during blocking I/O calls. See the documentation section on asynchronous Javascript calls for more details.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the requested YModule object

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

led→get_power()
led→power()

YLed

Returns the current led state.

js	function **get_power**( )
nodejs	function **get_power**( )
php	function **get_power**( )
cpp	Y_POWER_enum **get_power**( )
m	-(Y_POWER_enum) power
pas	function **get_power**( ): Integer
vb	function **get_power**( ) As Integer
cs	int **get_power**( )
java	int **get_power**( )
py	def **get_power**( )
cmd	YLed **target** **get_power**

Returns :

either `Y_POWER_OFF` or `Y_POWER_ON`, according to the current led state

On failure, throws an exception or returns `Y_POWER_INVALID`.

led→get_userData()
led→userData()

YLed

Returns the value of the userData attribute, as previously stored using method `set_userData`.

js	function **get_userData**( )
nodejs	function **get_userData**( )
php	function **get_userData**( )
cpp	void * **get_userData**( )
m	-(void*) userData
pas	function **get_userData**( ): Tobject
vb	function **get_userData**( ) As Object
cs	object **get_userData**( )
java	Object **get_userData**( )
py	def **get_userData**( )

This attribute is never touched directly by the API, and is at disposal of the caller to store a context.

Returns :
the object stored previously by the caller.

led→isOnline() YLed

Checks if the led is currently reachable, without raising any error.

js	function **isOnline**( )
nodejs	function **isOnline**( )
php	function **isOnline**( )
cpp	bool **isOnline**( )
m	-(BOOL) **isOnline**
pas	function **isOnline**( ): boolean
vb	function **isOnline**( ) As Boolean
cs	bool **isOnline**( )
java	boolean **isOnline**( )
py	def **isOnline**( )

If there is a cached value for the led in cache, that has not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the device hosting the led.

Returns :
`true` if the led can be reached, and `false` otherwise

led→isOnline_async() YLed

Checks if the led is currently reachable, without raising any error (asynchronous version).

js	function **isOnline_async**(**callback**, **context**)
nodejs	function **isOnline_async**(**callback**, **context**)

If there is a cached value for the led in cache, that has not yet expired, the device is considered reachable. No exception is raised if there is an error while trying to contact the device hosting the requested function.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking the Javascript virtual machine.

Parameters :

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the boolean result

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

led→load() YLed

Preloads the led cache with a specified validity duration.

js	function **load**(**msValidity**)
nodejs	function **load**(**msValidity**)
php	function **load**(**$msValidity**)
cpp	YRETCODE **load**(int **msValidity**)
m	-(YRETCODE) **load** : (int) **msValidity**
pas	function **load**(**msValidity**: integer): YRETCODE
vb	function **load**(ByVal **msValidity** As Integer) As YRETCODE
cs	YRETCODE **load**(int **msValidity**)
java	int **load**(long **msValidity**)
py	def **load**(**msValidity**)

By default, whenever accessing a device, all function attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network traffic for instance.

Parameters :

msValidity an integer corresponding to the validity attributed to the loaded function parameters, in milliseconds

Returns :

`YAPI_SUCCESS` when the call succeeds.

On failure, throws an exception or returns a negative error code.

led→load_async() YLed

Preloads the led cache with a specified validity duration (asynchronous version).

js	function **load_async**(**msValidity**, **callback**, **context**)
nodejs	function **load_async**(**msValidity**, **callback**, **context**)

By default, whenever accessing a device, all function attributes are kept in cache for the standard duration (5 ms). This method can be used to temporarily mark the cache as valid for a longer period, in order to reduce network trafic for instance.

This asynchronous version exists only in Javascript. It uses a callback instead of a return value in order to avoid blocking the Javascript virtual machine.

Parameters :

msValidity an integer corresponding to the validity of the loaded function parameters, in milliseconds

callback callback function that is invoked when the result is known. The callback function receives three arguments: the caller-specific context object, the receiving function object and the error code (or `YAPI_SUCCESS`)

context caller-specific object that is passed as-is to the callback function

Returns :

nothing : the result is provided to the callback.

led→nextLed() YLed

Continues the enumeration of leds started using `yFirstLed()`.

js	function **nextLed**( )
nodejs	function **nextLed**( )
php	function **nextLed**( )
cpp	YLed * **nextLed**( )
m	-(YLed*) **nextLed**
pas	function **nextLed**( ): TYLed
vb	function **nextLed**( ) As YLed
cs	YLed **nextLed**( )
java	YLed **nextLed**( )
py	def **nextLed**( )

Returns :

a pointer to a `YLed` object, corresponding to a led currently online, or a `null` pointer if there are no more leds to enumerate.

led→registerValueCallback() YLed

Registers the callback function that is invoked on every change of advertised value.

js	function **registerValueCallback**(**callback**)
nodejs	function **registerValueCallback**(**callback**)
php	function **registerValueCallback**(**$callback**)
cpp	int **registerValueCallback**(YLedValueCallback **callback**)
m	-(int) **registerValueCallback** : (YLedValueCallback) **callback**
pas	function **registerValueCallback**(**callback**: TYLedValueCallback): LongInt
vb	function **registerValueCallback**( ) As Integer
cs	int **registerValueCallback**(ValueCallback **callback**)
java	int **registerValueCallback**(UpdateCallback **callback**)
py	def **registerValueCallback**(**callback**)

The callback is invoked only during the execution of `ySleep` or `yHandleEvents`. This provides control over the time when the callback is triggered. For good responsiveness, remember to call one of these two functions periodically. To unregister a callback, pass a null pointer as argument.

Parameters :

callback the callback function to call, or a null pointer. The callback function should take two arguments: the function object of which the value has changed, and the character string describing the new advertised value.

led→set_blinking() led→setBlinking() YLed

Changes the current led signaling mode.

js	function **set_blinking**(**newval**)
nodejs	function **set_blinking**(**newval**)
php	function **set_blinking**(**$newval**)
cpp	int **set_blinking**(Y_BLINKING_enum **newval**)
m	-(int) setBlinking : (Y_BLINKING_enum) **newval**
pas	function **set_blinking**(**newval**: Integer): integer
vb	function **set_blinking**(ByVal **newval** As Integer) As Integer
cs	int **set_blinking**(int **newval**)
java	int **set_blinking**(int **newval**)
py	def **set_blinking**(**newval**)
cmd	YLed **target** **set_blinking** **newval**

Parameters :

newval a value among `Y_BLINKING_STILL`, `Y_BLINKING_RELAX`, `Y_BLINKING_AWARE`, `Y_BLINKING_RUN`, `Y_BLINKING_CALL` and `Y_BLINKING_PANIC` corresponding to the current led signaling mode

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

led→set_logicalName() led→setLogicalName() YLed

Changes the logical name of the led.

js	function **set_logicalName**(**newval**)
nodejs	function **set_logicalName**(**newval**)
php	function **set_logicalName**(**$newval**)
cpp	int **set_logicalName**(const string& **newval**)
m	-(int) setLogicalName : (NSString*) **newval**
pas	function **set_logicalName**(**newval**: string): integer
vb	function **set_logicalName**(ByVal **newval** As String) As Integer
cs	int **set_logicalName**(string **newval**)
java	int **set_logicalName**(String **newval**)
py	def **set_logicalName**(**newval**)
cmd	YLed **target set_logicalName newval**

You can use `yCheckLogicalName()` prior to this call to make sure that your parameter is valid. Remember to call the `saveToFlash()` method of the module if the modification must be kept.

Parameters :

newval a string corresponding to the logical name of the led.

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

led→set_luminosity() led→setLuminosity() YLed

Changes the current led intensity (in per cent).

js	function **set_luminosity**(**newval**)
nodejs	function **set_luminosity**(**newval**)
php	function **set_luminosity**(**$newval**)
cpp	int **set_luminosity**(int **newval**)
m	-(int) setLuminosity : (int) **newval**
pas	function **set_luminosity**(**newval**: LongInt): integer
vb	function **set_luminosity**(ByVal **newval** As Integer) As Integer
cs	int **set_luminosity**(int **newval**)
java	int **set_luminosity**(int **newval**)
py	def **set_luminosity**(**newval**)
cmd	YLed **target** **set_luminosity** **newval**

Parameters :

newval an integer corresponding to the current led intensity (in per cent)

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

led→set_power()
led→setPower()

YLed

Changes the state of the led.

js	function **set_power**(**newval**)
nodejs	function **set_power**(**newval**)
php	function **set_power**(**$newval**)
cpp	int **set_power**(Y_POWER_enum **newval**)
m	-(int) setPower : (Y_POWER_enum) **newval**
pas	function **set_power**(**newval**: Integer): integer
vb	function **set_power**(ByVal **newval** As Integer) As Integer
cs	int **set_power**(int **newval**)
java	int **set_power**(int **newval**)
py	def **set_power**(**newval**)
cmd	YLed **target set_power newval**

Parameters :

newval either `Y_POWER_OFF` or `Y_POWER_ON`, according to the state of the led

Returns :

`YAPI_SUCCESS` if the call succeeds.

On failure, throws an exception or returns a negative error code.

led→set_userData()
led→setUserData() YLed

Stores a user context provided as argument in the userData attribute of the function.

js	function **set_userData**(**data**)
nodejs	function **set_userData**(**data**)
php	function **set_userData**(**$data**)
cpp	void **set_userData**(void* **data**)
m	-(void) setUserData : (void*) **data**
pas	procedure **set_userData**(**data**: Tobject)
vb	procedure **set_userData**(ByVal **data** As Object)
cs	void **set_userData**(object **data**)
java	void **set_userData**(Object **data**)
py	def **set_userData**(**data**)

This attribute is never touched by the API, and is at disposal of the caller to store a context.

Parameters :

data any kind of object to be stored

led→wait_async() YLed

Waits for all pending asynchronous commands on the module to complete, and invoke the user-provided callback function.

js	function **wait_async**(**callback**, **context**)
nodejs	function **wait_async**(**callback**, **context**)

The callback function can therefore freely issue synchronous or asynchronous commands, without risking to block the Javascript VM.

Parameters :

callback callback function that is invoked when all pending commands on the module are completed. The callback function receives two arguments: the caller-specific context object and the receiving function object.

context caller-specific object that is passed as-is to the callback function

Returns :

nothing.

20. Troubleshooting

20.1. Linux and USB

To work correctly under Linux, the the library needs to have write access to all the Yoctopuce USB peripherals. However, by default under Linux, USB privileges of the non-root users are limited to read access. To avoid having to run the *VirtualHub* as root, you need to create a new *udev* rule to authorize one or several users to have write access to the Yoctopuce peripherals.

To add a new *udev* rule to your installation, you must add a file with a name following the "`##-arbitraryName.rules`" format, in the "`/etc/udev/rules.d`" directory. When the system is starting, *udev* reads all the files with a "`.rules`" extension in this directory, respecting the alphabetical order (for example, the "`51-custom.rules`" file is interpreted AFTER the "`50-udev-default.rules`" file).

The "`50-udev-default`" file contains the system default *udev* rules. To modify the default behavior, you therefore need to create a file with a name that starts with a number larger than 50, that will override the system default rules. Note that to add a rule, you need a root access on the system.

In the `udev_conf` directory of the *VirtualHub* for Linux[1] archive, there are two rule examples which you can use as a basis.

Example 1: 51-yoctopuce.rules

This rule provides all the users with read and write access to the Yoctopuce USB peripherals. Access rights for all other peripherals are not modified. If this scenario suits you, you only need to copy the "`51-yoctopuce_all.rules`" file into the "`/etc/udev/rules.d`" directory and to restart your system.

```
# udev rules to allow write access to all users
# for Yoctopuce USB devices
SUBSYSTEM=="usb", ATTR{idVendor}=="24e0", MODE="0666"
```

Example 2: 51-yoctopuce_group.rules

This rule authorizes the "yoctogroup" group to have read and write access to Yoctopuce USB peripherals. Access rights for all other peripherals are not modified. If this scenario suits you, you

[1] http://www.yoctopuce.com/FR/virtualhub.php

only need to copy the "`51-yoctopuce_group.rules`" file into the "`/etc/udev/rules.d`" directory and restart your system.

```
# udev rules to allow write access to all users of "yoctogroup"
# for Yoctopuce USB devices
SUBSYSTEM=="usb", ATTR{idVendor}=="24e0", MODE="0664", GROUP="yoctogroup"
```

20.2. ARM Platforms: HF and EL

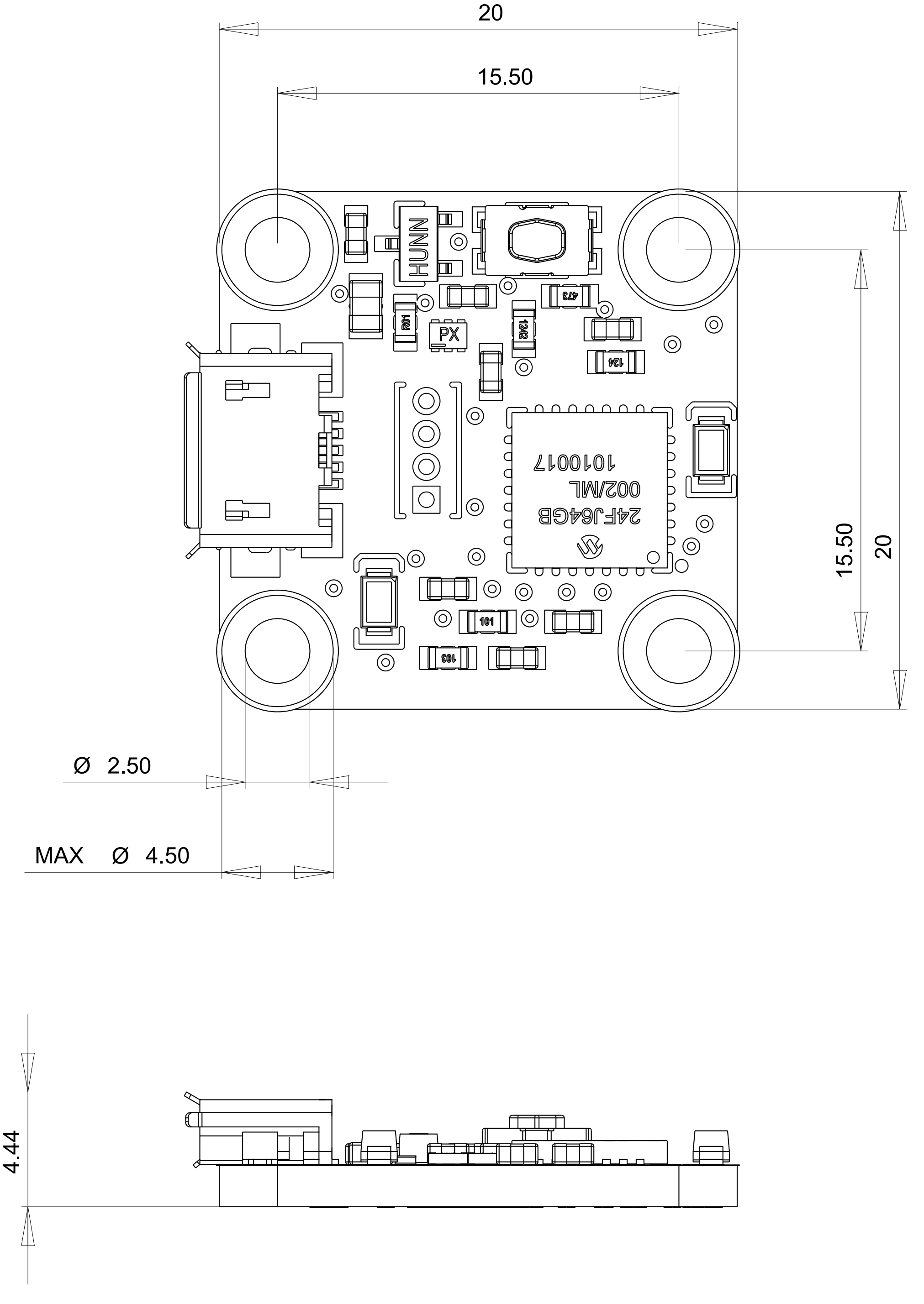
There are two main flavors of executable on ARM: HF (Hard Float) binaries, and EL (EABI Little Endian) binaries. These two families are not compatible at all. The compatibility of a given ARM platform with of one of these two families depends on the hardware and on the OS build. ArmHL and ArmEL compatibility problems are quite difficult to detect. Most of the time, the OS itself is unable to make a difference between an HF and an EL executable and will return meaningless messages when you try to use the wrong type of binary.

All pre-compiled Yoctopuce binaries are provided in both formats, as two separate ArmHF et ArmEL executables. If you do not know what family your ARM platform belongs to, just try one executable from each family.

21. Characteristics

You can find below a summary of the main technical characteristics of your Yocto-Demo module.

Width	20 mm
Length	20 mm
Weight	2 g
USB connector	micro-B
Supported Operating Systems	Windows, Linux (Intel + ARM), Mac OS X, Android
Drivers	no driver needed
API / SDK / Libraries (USB+TCP)	C++, Objective-C, C#, VB .NET, Delphi, Python, Java/Android
API / SDK / Libraries (TCP only)	Javascript, Node.js, PHP, Java
RoHS	yes
USB Vendor ID	0x24E0
USB Device ID	0x0009



All dimensions are in mm
Toutes les dimensions sont en mm

Yocto-Demo

A4

Scale
4:1
Echelle

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