

## 1. Flash an IoT Device

With this task we will start programming our own IoT devices.

For that we first look at the source code of two example applications that cover the basics.

*Tools:* `git`, `make`

- (a) Create a GitHub account if you don't have one already.
- (b) Fork the upstream RIOT-OS repository (<https://github.com/RIOT-OS/RIOT>) with your account.
- (c) Clone the forked repository on your machine.
- (d) Run the following command from the RIOT root directory to compile, flash and run the gcoap test application on your IoT device:

```
BOARD=pba-d-01-kw2x make -C examples/gcoap all flash term
```

- (e) Explore the RIOT shell on the IoT device and get familiar with available commands.
- (f) Look at the `*.c` files of the example application and discuss how it works.
- (g) Flash and explore another firmware example (*examples/saul*).

## 2. Manage your Code

To build your own IoT firmware you will need a clean development environment. Follow the given structure and always commit all your changes to your repositories to be able to track any changes during development. Later assignments will build on top of the code so it pays off to keep everything organized.

*Tools:* `git`

- (a) Create a separate repository for your own application that references your RIOT fork as a git submodule.
  - i. Your new application will reside in a separate folder *outside* of the RIOT code base.
  - ii. Changes that affect the RIOT code base should be committed to your fork — however, this should not be necessary for now.

## 3. Program Custom IoT Firmware

Create your own firmware that provides CoAP access to all peripherals (sensors/LEDs) of the IoT node.

*Tools:* `git`, `make`, `C`

- (a) Program shell command handlers that allow to manually issue CoAP requests via the serial terminal of the IoT node (see the gcoap example).
- (b) Program additional handlers for accessing all sensor values via the SAUL interface.
- (c) Use the CoAP commands to read out sensors of other teams.
- (d) Use the CoAP commands to change the LED color of other teams.