Tutorial 1 - Getting Started with Contiki

Aim

Contiki is an event based operating system that designed to operate on resource scarce and low power embedded system platforms. This tutorial shows you how to compile a Contiki program and install it on the SensorTag, introduces the basic concepts and syntax of the Contiki. Contiki is developed in a Linux based environment.

- **Contiki Concepts**

1. Compiling and programming
2. Processes

Virtual Machine

Linux Virtual Machine Environment – The Comp6733 Linux Virtual Machine will be used as the programming environment.

Start the COMP6733 on the CSE Lyre Lab PC:

%vmware

choose 4 (COMP6733)

username: comp6733, password (root): comp6733

NOTE: Please save/copy all your work to CSE_Home folder, which is your CSE home directory because all the modifications in the VM will be lost after logging out/reboot.

Compiling and Installing

As a first exercise, you'll compile and install a simple Contiki application to flash the LED and print a message to a serial terminal. Contiki uses a powerful and extensible make system that allows you to easily add new platforms and compilation options.

Compiling Contiki

To compile a contiki program, you must use specify a target, when running make. The target is the platform that you will be running your program on.

```
make TARGET=<platform>
```

You can compile contiki based programs to run natively (without a platform) on your VM. You will need to use the native target. Open a terminal window and change directory to the **hello_world example folder in contiki-git/examples** and compile it with the following command:

```
make TARGET=native
```

Once compilation is complete, object and binary files will be created in the directory. To execute the program in your VM, type the following commands and view the output in your terminal window:

```
./hello-world.native
```

To remove the generated object and binary files, you can use the make clean option. Use this option, when compiling for new platforms.

```
make clean
```

Installing on a SensorTag

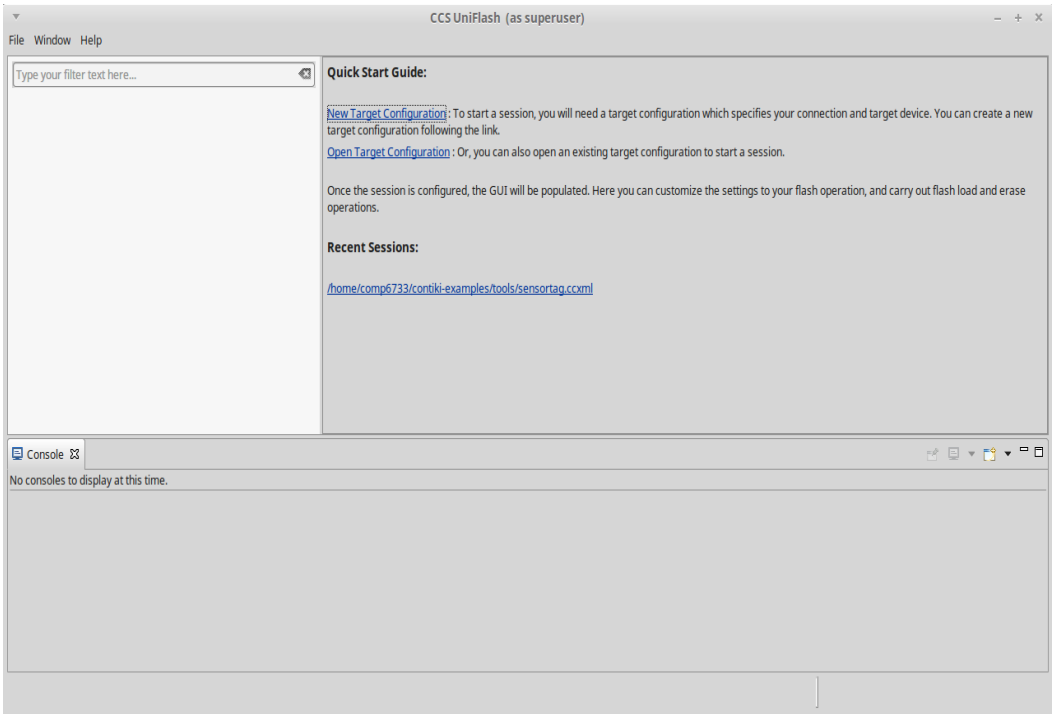
This example uses a SensorTag. To download your program onto the SensorTag, connect the SensorTag to the USB port, which will appear as a USB serial port in your Virtual Machine USB devices list. Select your USB serial port and make sure /dev/ttyACM0 is present. You may have to manually connect your USB device to your virtual machine. To check if you SensorTag is connected: type the following: "ls –l /dev/ttyACM*", which will return "/dev/ttyAM0", if your SensorTag is connected.

Erase your SensorTag: You need to erase your SensorTag before loading a new program. You can attempt to use the graphical CCS Uniflash program (Linux). Open the uniflash program by the typing following command in your terminal:

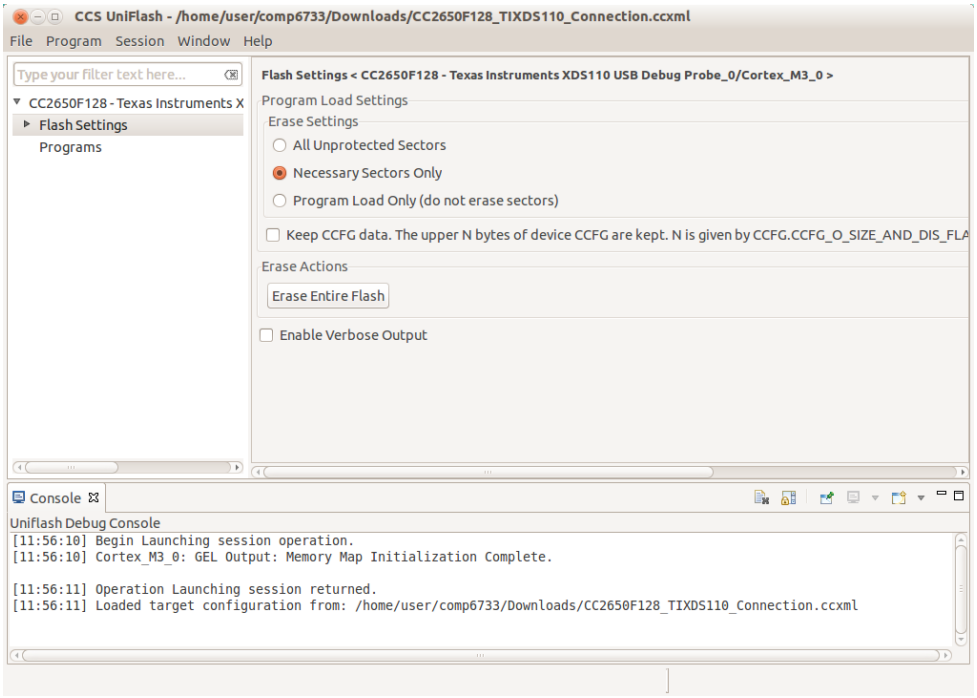
sudo /home/comp6733/uniflash_3.4/eclipse/uniflash

Then, after opening the Uniflash program:

1. Click the /home/comp6733/contiki-examples/tools/sensortag.ccxml under "recent sessions"



2. Erase the SensorTag. Select “Necessary Sectors Only”. Press “Erase Entire Flash”.



3. Load the program by clicking “program” **on the menubar** and then select “load Program” and change directory to your folder and select the .elf file.
   (after erasing the SensorTag, you may able to load your program directly using the ‘make prog’ command in the terminal.) Or you can following the instruction below:
4. Select “Programs”, make sure your program_name.elf is selected. Press “Program” to load your program into the SensorTag.

NOTE: Please make sure that you have erased your SensorTag before loading a new program.

Navigate to the **/home/comp6733/contiki-examples/hello-world** folder. **DO NOT USE the contiki-git/examples/hello-world.** Then type the following make command to compile the Hello-World executable (Note you have to specify an additional definition BOARD):

```
make TARGET=srf06-cc26xx BOARD=sensortag/cc2650
```

To program the SensorTag, first make sure that the SensorTag (debug devpack) is connected via USB to the PC. Type the following command

```
sudo make prog
```

NOTE: This will take time to do. Ignore the following error:

```
"error: IcePick_C: Error connecting to the target: (Error -1040 @
0x0) A firmware update is required for the debug probe. Click the
```

```
"Update" button to update the firmware and connect to the debug
target. DO NOT UNPLUG THE DEBUG PROBE DURING THE UPDATE.
(Emulation package 6.0.14.5)  "
```

Reset SensorTag

Now you've downloaded the program to the SensorTag, in order to run the program, you need to disconnect the minuUSB with the SensorTag, and then re-plug in to power on. Then you can see the gree LED flashes every 1s. The SensorTag can be reset but pressing the reset button on the debug devpack board (see SensorTag Pinout document). This will only reset the CC2650 processor on the SensorTag. The serial port will still be active.

Conclusion

This lesson has introduced the process concept of the Contiki operating system. Refer to ex1_helloworld example and to the Contiki documentation for more information.

Related Documentation

- Contiki Wiki
- Contiki Processes Wiki