Project Overview:

Goal: Port **Contiki-NG** to the **EFR32ZG28B312F1024IM48** (Silicon Labs Wireless Gecko Series 2) board and verify hardware functionality (UART, LEDs, etc.).

- ✔ Contiki-NG does not directly support the EFR32ZG28 board. But we can make it work by writing our own driver files for the board and adding them to Contiki-NG.
- ✔ This means creating code to control things like UART, timers, GPIO pins, and also using startup and system files from the Gecko SDK.
- ✔ After we set up these files and configure them properly, we can compile Contiki-NG for the EFR32ZG28. We also need to make a platform Makefile, use the correct linker script, and set the right memory addresses for the chip.
- ✔ If we write all the needed drivers and set up the build environment correctly, the board should be able to run Contiki-NG.

step 1:To set the ubutu to install the contiki-ng os .

- sudo apt update
- sudo apt install git build-essential python3 python3-pip python3-setuptools python3-wheel srecord doxygen
- sudo apt install gcc-arm-none-eabi binutils-arm-none-eabi gdb-multiarch //GNU Arm Embedded Toolchain

Step2: Install the contiki os

- git clone https://github.com/contiki-ng/contiki-ng.git
- cd contiki-ng

- git submodule update --init –recursive // It helps to Fetch submodules like `OS,examples,tools`

- `arch/` → `CPU & platform architecture support`
- `examples/` → `Sample apps (hello-world, coap, etc.)`
- `os/` → `Contiki-NG core (kernel, networking)`

  `tools/` → `Helper scripts & utilities`

step 3: To write the board support files like a

contiki-ng/arch/platform/gecko/efr32zg28b312f1024im48/ // This location to write my board support files .

- To write a CPU file to manually to write in the contiki-ng os for the efr32zg28b312f1024im48 board support

step 4: To get the board support files from Simplicity Studio

- Startup & System Files platform/Device/SiliconLabs/EFR32ZG28/Source
- `startup_efr32zg28.S` → Assembly file that sets up the stack pointer, calls `main()`
- `system_efr32zg28.c` → Configures system clock, oscillators, and power modes

Device Header Files

platform/Device/SiliconLabs/EFR32ZG28/Include/

`em_device.h` → MCU register definitions

- `efr32zg28b312f1024im48.h` → Chip-specific defines (RAM, Flash sizes, IRQ numbers)
- `core_cm33.h` → ARM Cortex-M33 core register defines

Linker Script:

platform/Device/SiliconLabs/EFR32ZG28/Source/GCC/

`efr32zg28.ld` → Defines Flash start address, RAM size, vector table location

If not present, you can take the linker script from a Simplicity Studio project generated for your board.

The Flash address start like a

FLASH (rx) : ORIGIN = 0x08000000, LENGTH = 1024K

RAM (rwx) : ORIGIN = 0x20000000, LENGTH = 256K

How to Extract Files from Simplicity Studio

- create a new simplicity studio project
- Select:

- **Board**: EFR32ZG28B312F1024IM48
- **SDK**: Gecko SDK v3.x.x
- **Toolchain**: GCC

- Choose **"Empty C Project"** or "Blink LED" (simplest).
- Generate code

To add a peripheral, open the `.slcp` file and click on **Software Components**, then search for whatever you need (e.g., UART) and install it from there.

- Find generated project files
- `autogen/` → Auto-generated pin/board configs

- `config/` → Peripheral initialization configs
- `src/` → Your code
- `.slcp` → Project configuration file

Copy needed files to Contiki-NG

- cp ~/SimplicityStudio/SDKs/gecko_sdk_3/platform/Device/SiliconLabs/EFR32ZG28/Source/startup_efr32zg28.S ~/Documents/contiki-ng/arch/platforms/efr32zg28/
- cp ~/SimplicityStudio/SDKs/gecko_sdk_3/platform/Device/SiliconLabs/EFR32ZG28/Source/system_efr32zg28.c ~/Documents/contiki-ng/arch/platforms/efr32zg28/
- cp ~/SimplicityStudio/SDKs/gecko_sdk_3/platform/emlib/src/em_gpio.c ~/Documents/contiki-ng/arch/platforms/efr32zg28/
- cp ~/SimplicityStudio/SDKs/gecko_sdk_3/platform/emlib/src/em_usart.c ~/Documents/contiki-ng/arch/platforms/efr32zg28/

cd /Documents/phytec_week2_tasks/contiki-ng/examples/uart-write-test

this directory contains the main.c file and make file

Step 5: to build the project

make TARGET=gecko BOARD=efr32zg28b312f1024im48-board

If the build file like a

~/Documents/phytec_week2_tasks/contiki-ng/examples/uart-test-write/build/gecko/efr32zg28b312f1024im48-board$ ls

obj uart-test-write.gecko

It contions the .gecko build file now to flash to need like a .hex or .bin file to convert a .hex file

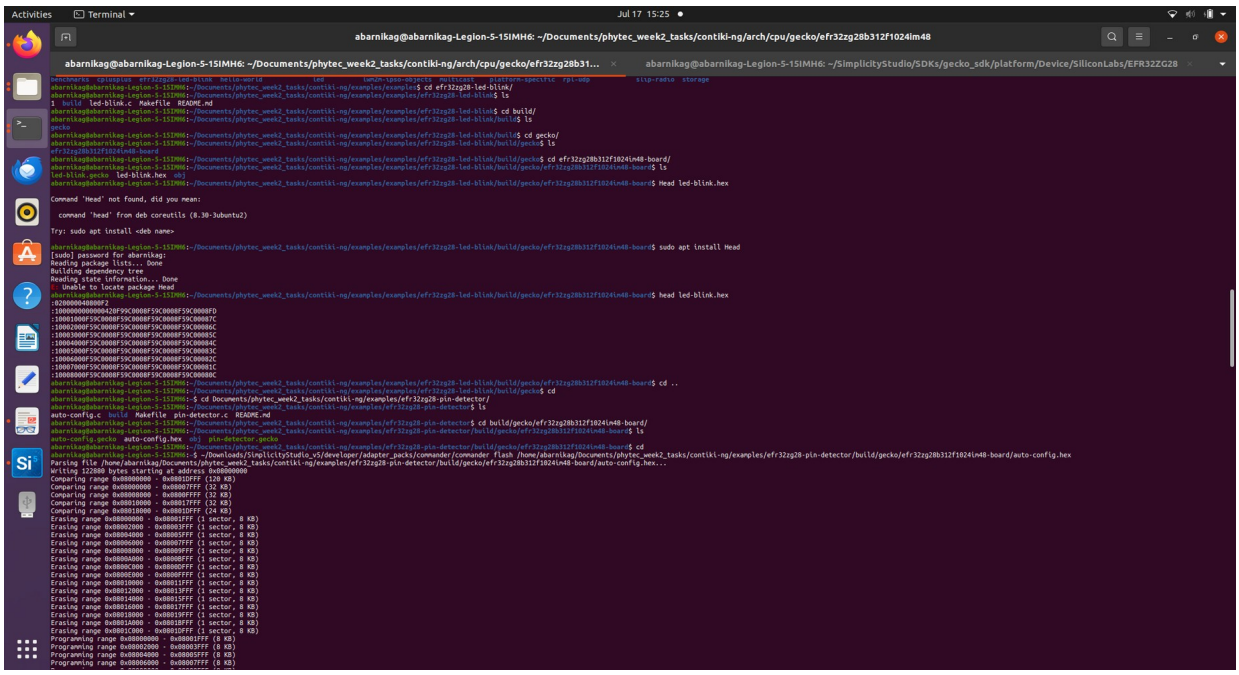
step 6: the contiki-ng use the ARM GCC toolchain

arm-none-eabi-objcopy -O ihex uart-write-test.gecko uart-write-test.hex

now to get the .hex file

step 7: To flash the file using

- **Simplicity Commander**

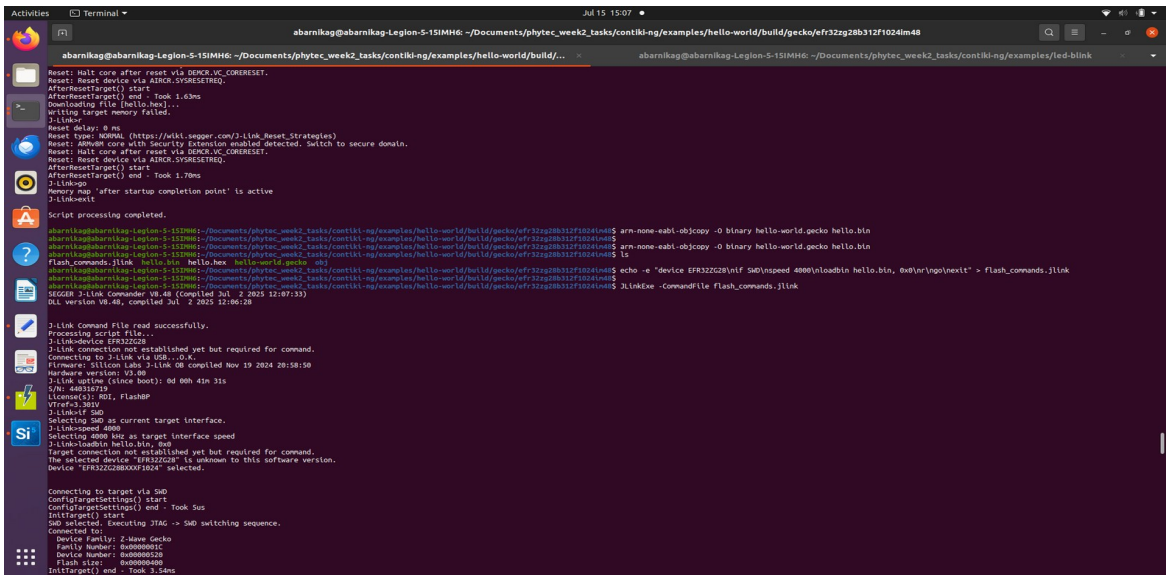


->

Downloads/SimplicityStudio-5/SimplicityStudio_v5/developer/adapter_packs/commander/commander flash ~/Documents/phytec_week2_tasks/contiki-ng/examples/uart-write-test/build/gecko/efr32zg28b312f1024im48-board/uart-write-test.hex --device EFR32ZG28B312F1024IM48

To use this command to flash

- **J-Link Commander**



I am using the commander to flash .

Step 8: After flash i want to try to get output in the minicom

minicom -D /dev/ttyACM0 -b 115200

I successfully flashed the firmware, but it doesn't seem to actually flash on the device. I don't know what the error is because no error message is shown.

I tried to print a character using loopback through a UART TTL converter, but it did not work.