Project Documentation

Project Title

Porting Zephyr RTOS to BGM220P (EFR32BG22 SoC)

Objective

To enable Zephyr RTOS support for the **Silicon Labs BGM220P** module by creating a custom board configuration and successfully building and running a test application (`my_app`)

Target Platform

- **Board:** Silicon Labs BGM220P
- **SoC:** EFR32BG22C224F512IM40
- **Architecture:** ARM Cortex-M33
- **RTOS:** Zephyr 4.2.0-rc1
- **Toolchain:** Zephyr SDK 0.17.2

Key Accomplishments

Custom Board Support

- `bgm220p.dts`, `bgm220p.dtsi`, `pinctrl.dtsi files`
- `bgm220p_defconfig`
- `bgm220p_custom.c`, `bgm220p_custom.cmake`, `bgm220p_custom.yaml`
- `Kconfig.bgm220p_customtxt`

SoC Integration

- `Kconfig.soc`, `Kconfig.defconfig` for **EFR32BG22**
- Defined `SOC_PART_NUMBER` and `SOC_SERIES` cleanly
- Avoided recursive symbol dependencies

Toolchain Setup

- Verified: `ZEPHYR_SDK_INSTALL_DIR`
- Implemented: `toolchain.cmake` with correct GCC path
- Resolved: Compiler not found issue (`-gcc`)

Device Tree Configuration

- Included `<arm/silabs/efr32bg22.dtsi>`
- Defined LED GPIO for basic testing (`my_app`)

Build System Improvements

- Fixed CMake dependency loops
- Cleaned Kconfig warnings
- Ensured complete and error-free `west build` process

Example Application – `my_app`

A simple test to validate the GPIO and timing system:

- Blinks LED using Zephyr `gpio` and `k_sleep()` APIs
- Confirms custom board and SoC integration works correctly

Project Structure (Key Files)

```
zephyr/
├── boards/arm/bgm220p/
│   ├── bgm220p_custom.dts
│   ├── bgm220p.dtsi
│   ├── pinctrl.dtsi
│   ├── bgm220p_defconfig
│   ├── bgm220p_custom.c
│   ├── bgm220p_custom.cmake
│   ├── bgm220p_custom.yaml
│   └── Kconfig.bgm220p_custom
├── soc/silabs/silabs_s2/efr32bg22/
│   ├── Kconfig.soc
│   └── Kconfig.defconfig
```

Troubleshooting & Fixes

1. Kconfig Dependency Loop

- **Issue:** `SOC_SERIES_EFR32BG22` selected itself recursively
- **Fix:** Removed `select` inside SoC configs; let it be selected via `PART_NUMBER`

2. Hidden Symbol Assigned Directly

- **Issue:** Assigned `CONFIG_SOC_SERIES_EFR32BG22=y`
- **Fix:** Used `CONFIG_SOC_PART_NUMBER_EFR32BG22C224F512IM40=y` instead

3. Undefined Symbol: `SOC_FAMILY_SILABS_S2`

- **Issue:** Symbol assigned but never defined
- **Fix:** Removed from defconfig; created proper Kconfig symbol if needed.

4. Kconfig Warnings as Errors

- **Issue:** Untyped symbols, undefined defaults
- **Fix:** Added `int`, `hex`, `bool` types and cleaned up undefined defaults.

5. Toolchain Compiler Not Found (`-gcc`)

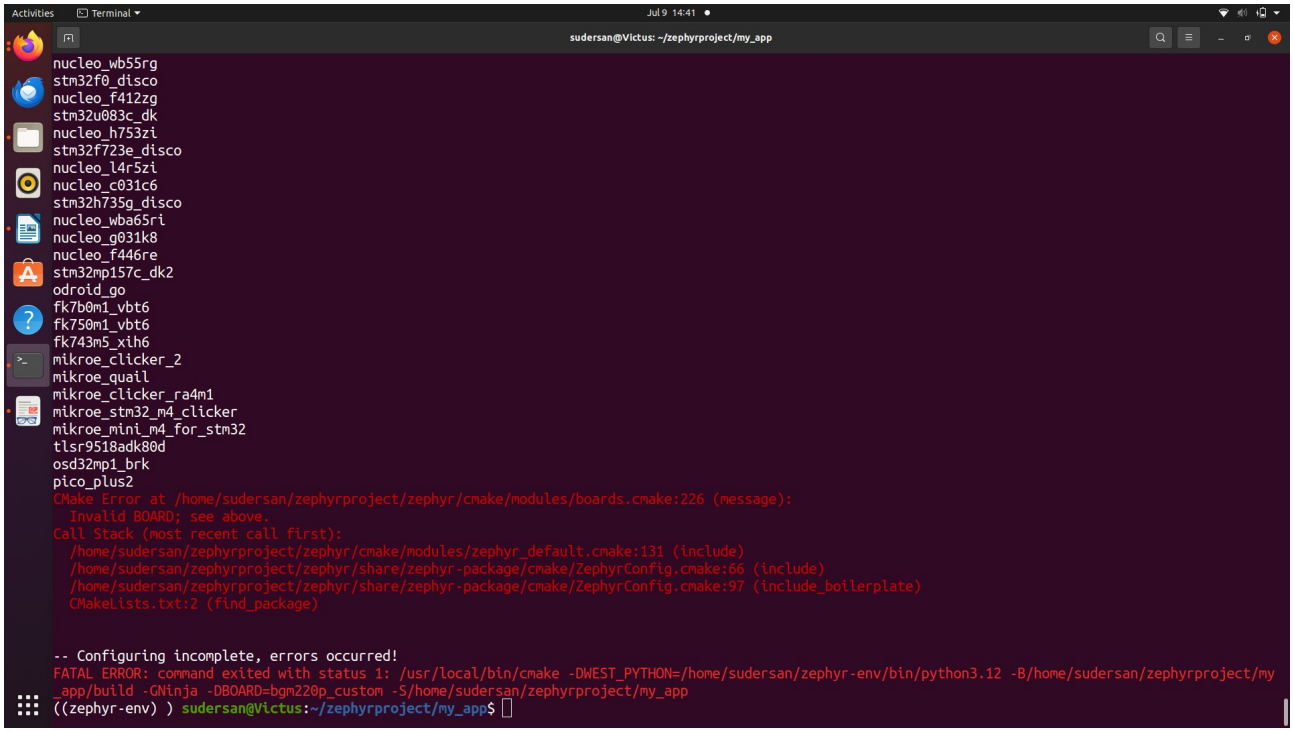
- **Issue:** Misconfiguration caused empty `CC`, leading to `-gcc\`

6. Toolchain Detected but Build Failed

- **Issue:** Extra slashes or unset `CC`/`CROSS_COMPILE`
- **Fix:** Verified `CROSS_COMPILE` and `CC`, cleared build directory and rebuilt

Final Outcome

- Successfully ported Zephyr RTOS to BGM220P
- Achieved clean and reproducible build of `blinky_app`
- Fixed all Kconfig, DTS, and build system issues
- Ready for further application development on BGM220P under Zephyr



`Invalid BOARD: bgm220p_custom`

Which means **Zephyr still doesn't recognize your custom board.**

Let's **definitely fix this now.**

1. **Do you have this folder?**

   ~/zephyrproject/zephyr/boards/arm/bgm220p_custom/

   ls ~/zephyrproject/zephyr/boards/arm/bgm220p_custom

You must see these 3 files:

bgm220p_custom.yaml

bgm_220p_custom.dts

CmakeLists.txt

2. **Run this to tell Zephyr where to look:**

   export ZEPHYR_BOARD_ROOT=$HOME/zephyrproject/zephyr

   echo $ZEPHYR_BOARD_ROOT

3. Check if Zephyr sees your board now:

west boards | grep bgm

bgm220p_custom

Still Doing on This Page trying to Port the Zephyr for the Silicon Labs BGM220P