CEC Continuing Education Center

DesignNews

Developing IoT Applications with Nordic nRF Modules

Day 1:
Install and Configure the nRF Connect SDK

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Webinar Logistics

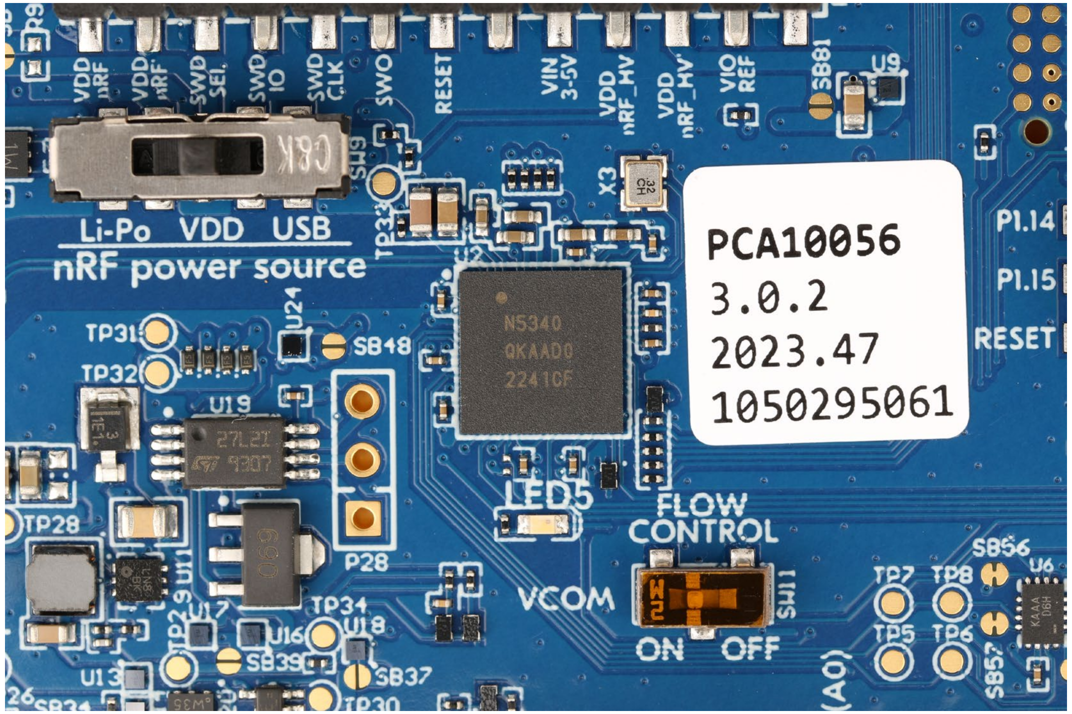
- Turn on your system sound to hear the streaming presentation.
- If you have technical problems, click “Help” or submit a question asking for assistance.
- Participate in ‘Attendee Chat’ by maximizing the chat widget in your dock.

Fred Eady

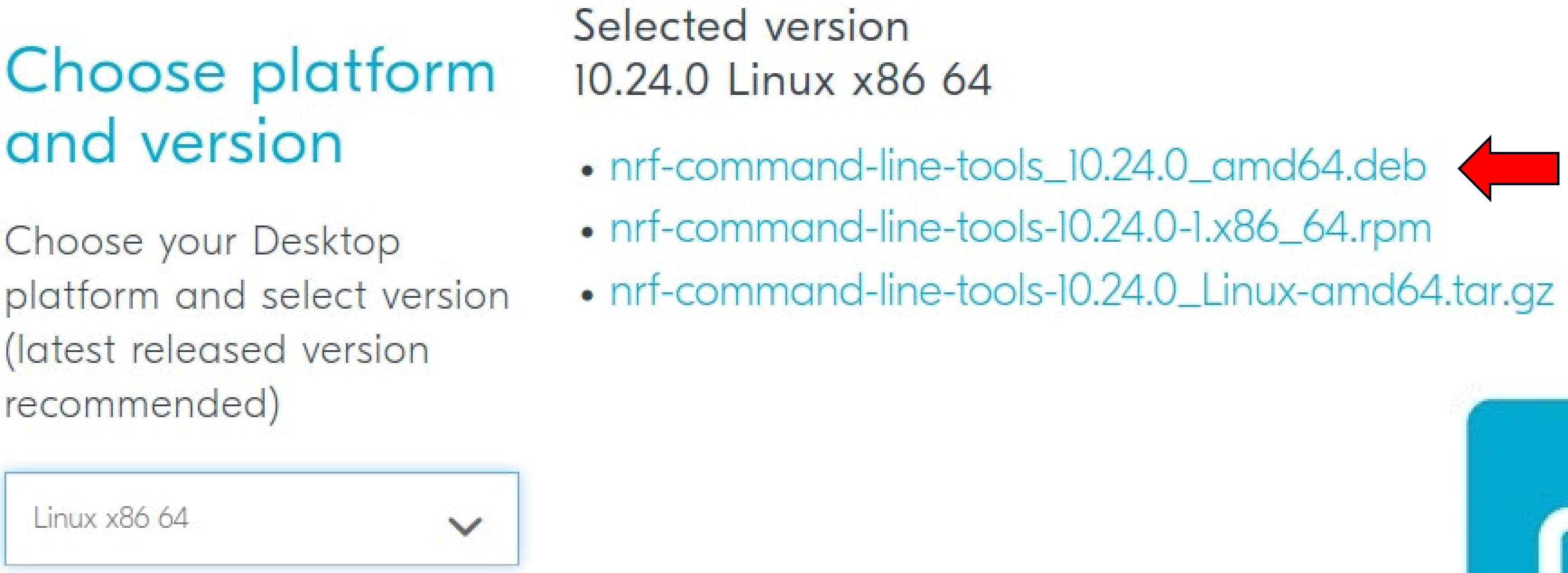
Visit ‘Lecturer Profile’ in your console for more details.

AGENDA

- Install the nRF Connect SDK
- Nordic nRF52840 DK Walk Around
- Build, Flash and Run *blinky*



nRF Command Line Tools



Choose platform and version

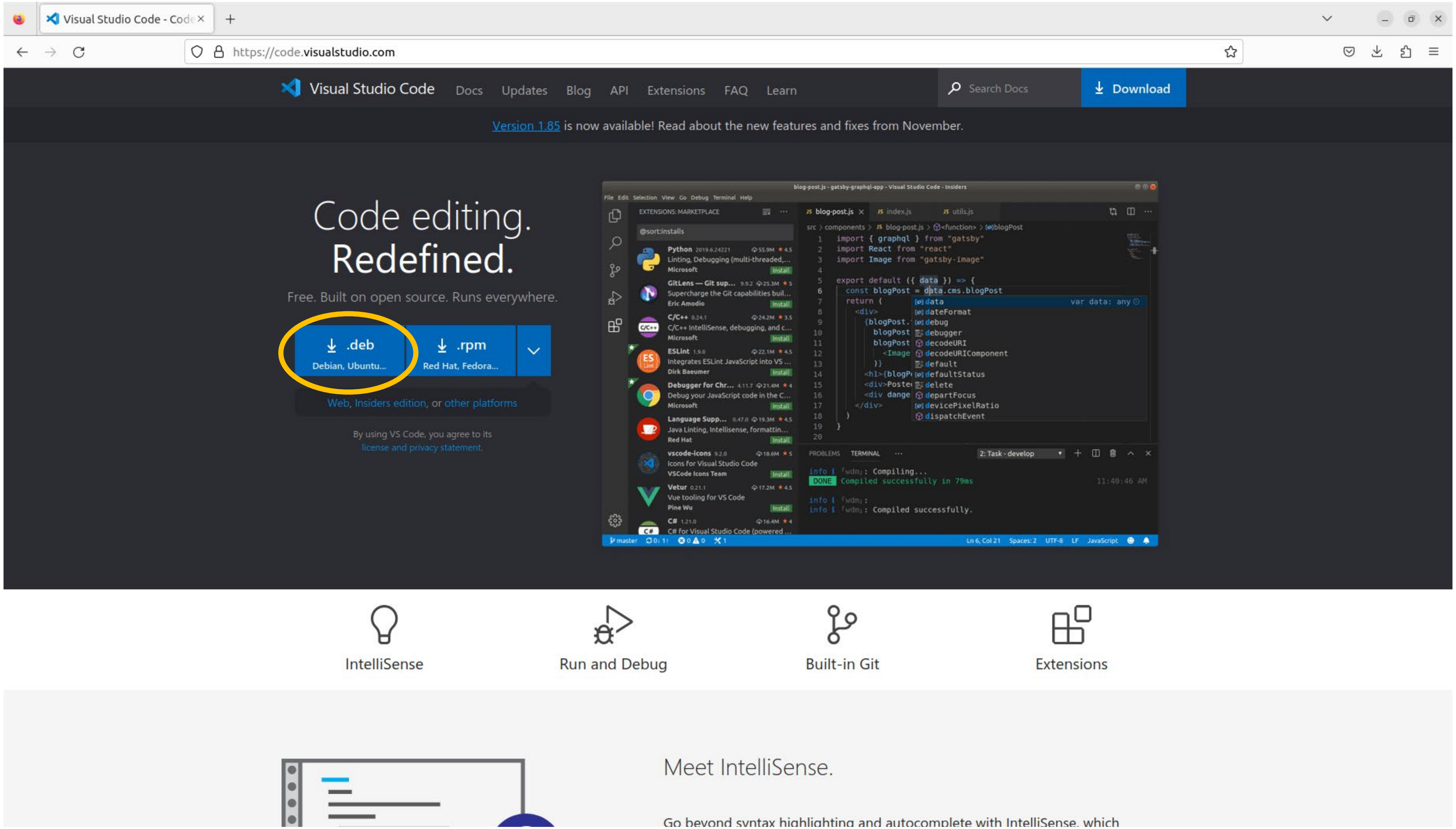
Choose your Desktop platform and select version (latest released version recommended)

Linux x86 64

Selected version
10.24.0 Linux x86 64

- nrf-command-line-tools_10.24.0_amd64.deb
- nrf-command-line-tools-10.24.0-1.x86_64.rpm
- nrf-command-line-tools-10.24.0_Linux-amd64.tar.gz

Visual Studio Code



Visual Studio Code - Code ×
+
https://code.visualstudio.com
Visual Studio Code
Docs
Updates
Blog
API
Extensions
FAQ
Learn
Search Docs
Download

Version 1.85 is now available! Read about the new features and fixes from November.

Code editing.
Redefined.

Free. Built on open source. Runs everywhere.

.deb
Debian, Ubuntu...
.rpm
Red Hat, Fedora...

Web, Insiders edition, or other platforms

By using VS Code, you agree to its
license and privacy statement.

blog-post.js - gatsby-graphql-app - Visual Studio Code - Insiders
File Edit Selection View Go Debug Terminal Help
EXTENSIONS: MARKETPLACE
@sort:installs
Python 2019.6.24221 55.9M 4.5
Linting, Debugging (multi-threaded,...
Microsoft Install
GitLens — Git sup... 9.9.2 25.3M 5
Supercharge the Git capabilities buil...
Eric Amodio Install
C/C++ 0.24.1 24.2M 3.5
C/C++ IntelliSense, debugging, and c...
Microsoft Install
ESLint 1.9.0 22.1M 4.5
Integrates ESLint JavaScript into VS ...
Dirk Baeumer Install
Debugger for Chr... 4.11.7 21.4M 4
Debug your JavaScript code in the C...
Microsoft Install
Language Supp... 0.47.0 19.3M 4.5
Java Linting, Intellisense, formattin...
Red Hat Install
vscode-icons 9.2.0 18.6M 5
Icons for Visual Studio Code
VSCode Icons Team Install
Vetur 0.21.1 17.2M 4.5
Vue tooling for VS Code
Pine Wu Install
C# 1.21.0 16.4M 4
C# for Visual Studio Code (powered ...
blog-post.js index.js utils.js
src > components > blog-post.js > <function> > blogPost

```
import { graphql } from "gatsby"
import React from "react"
import Image from "gatsby-image"

export default ({ data }) => {
  const blogPost = data.cms.blogPost
  return (            data                          var data: any
    <div>             dateFormat
      {blogPost.      debug
        blogPost      debugger
        blogPost      decodeURI
          <Image      decodeURIComponent
        )}            default
      <h1>{blogP      defaultStatus
      <div>Poste      delete
      <div dange      departFocus
    </div>            devicePixelRatio
  )                   dispatchEvent
}
```

```
info ｢wdm｣: Compiling...
DONE Compiled successfully in 79ms                    11:40:46 AM

info ｢wdm｣:
info ｢wdm｣: Compiled successfully.
```

Meet IntelliSense.

Go beyond syntax highlighting and autocomplete with IntelliSense, which

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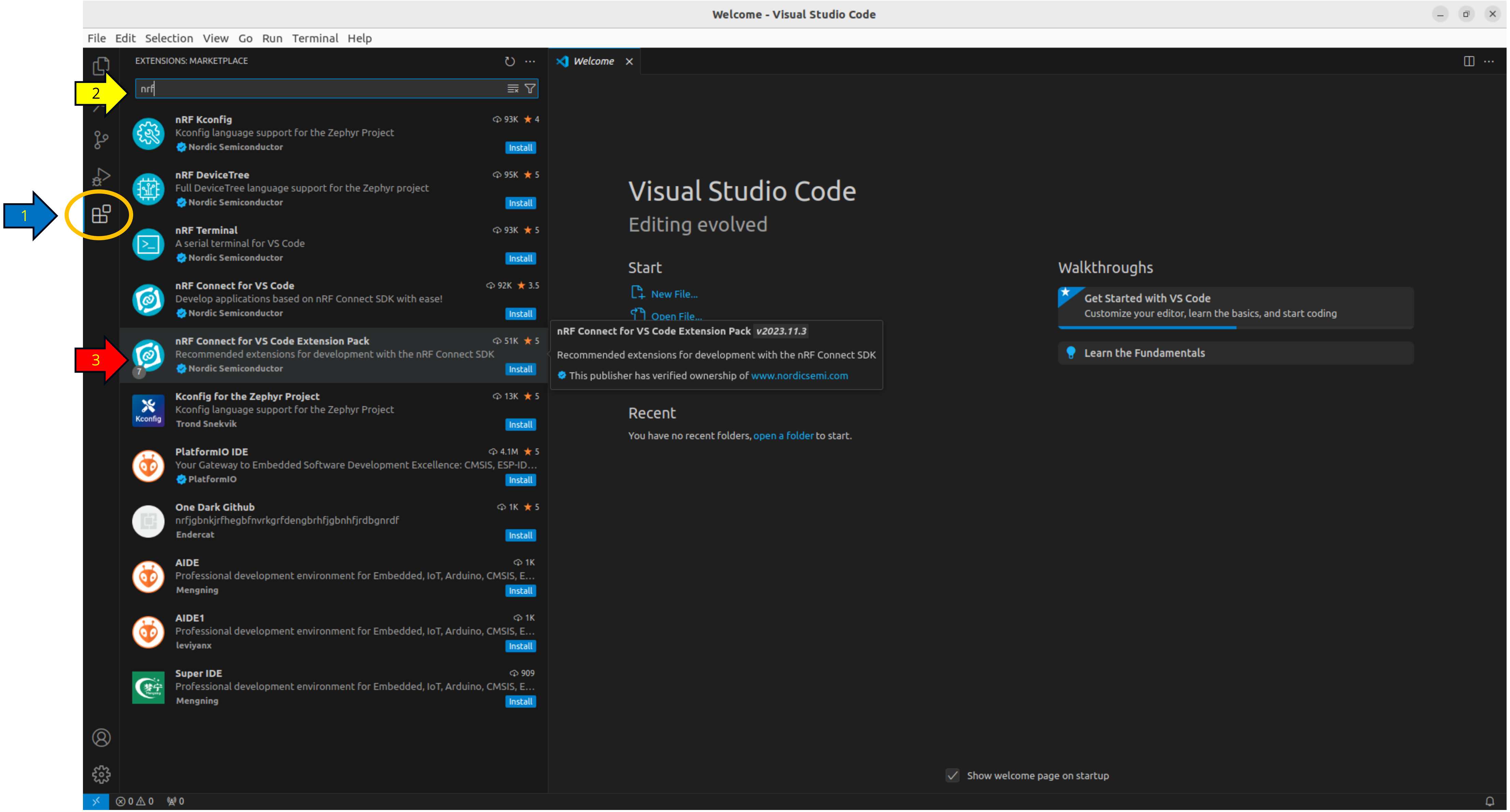
Developing IoT Applications with Nordic nRF Modules

Install and Configure the nRF Connect SDK

Install the nRF Connect SDK - nRF Prequisites

DigiKey

nRF Connect for Visual Studio Code Extension Pack


1
2
3
Welcome - Visual Studio Code
File Edit Selection View Go Run Terminal Help
EXTENSIONS: MARKETPLACE
Welcome
Show welcome page on startup
⊗ 0 ⚠ 0 0

nrf

nRF Kconfig 93K ★ 4
Kconfig language support for the Zephyr Project
Nordic Semiconductor
Install

nRF DeviceTree 95K ★ 5
Full DeviceTree language support for the Zephyr project
Nordic Semiconductor
Install

nRF Terminal 93K ★ 5
A serial terminal for VS Code
Nordic Semiconductor
Install

nRF Connect for VS Code 92K ★ 3.5
Develop applications based on nRF Connect SDK with ease!
Nordic Semiconductor
Install

nRF Connect for VS Code Extension Pack 51K ★ 5
Recommended extensions for development with the nRF Connect SDK
Nordic Semiconductor
Install

Kconfig for the Zephyr Project 13K ★ 5
Kconfig language support for the Zephyr Project
Trond Snekvik
Install

PlatformIO IDE 4.1M ★ 5
Your Gateway to Embedded Software Development Excellence: CMSIS, ESP-ID...
PlatformIO
Install

One Dark Github 1K ★ 5
nrfjgbnkjrfhegbfnvrkgrfdengbrhfjgbnhfjrdbgnrdf
Endercat
Install

AIDE 1K
Professional development environment for Embedded, IoT, Arduino, CMSIS, E...
Mengning
Install

AIDE1 1K
Professional development environment for Embedded, IoT, Arduino, CMSIS, E...
leviyanx
Install

Super IDE 909
Professional development environment for Embedded, IoT, Arduino, CMSIS, E...
Mengning
Install

nRF Connect for VS Code Extension Pack v2023.11.3

Recommended extensions for development with the nRF Connect SDK

This publisher has verified ownership of www.nordicsemi.com

Visual Studio Code

Editing evolved

Start

New File...

Open File...

Recent

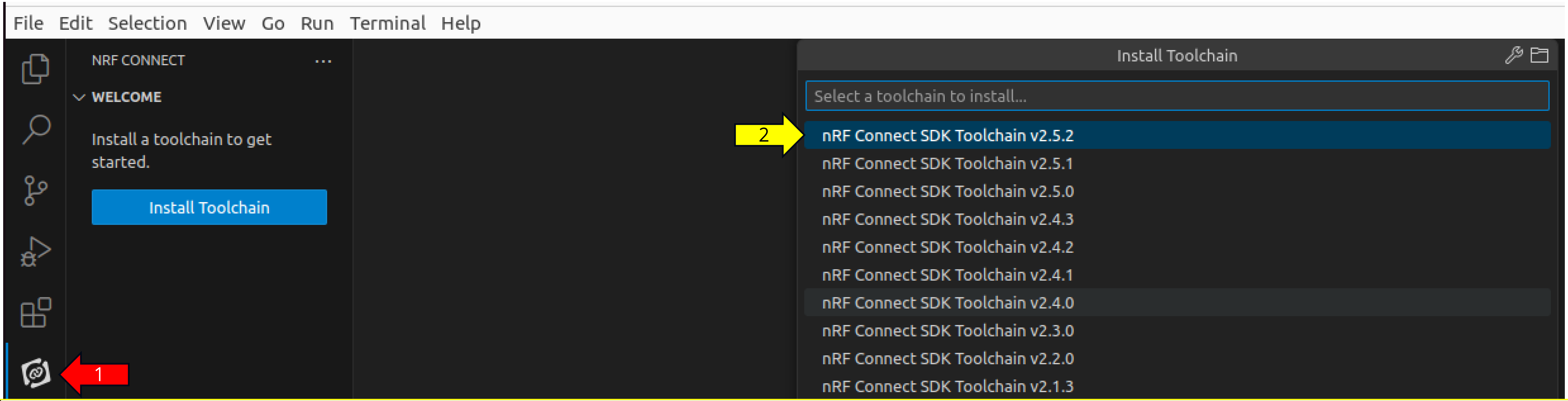
You have no recent folders, open a folder to start.

Walkthroughs

Get Started with VS Code
Customize your editor, learn the basics, and start coding

Learn the Fundamentals

nRF Connect SDK Toolchain



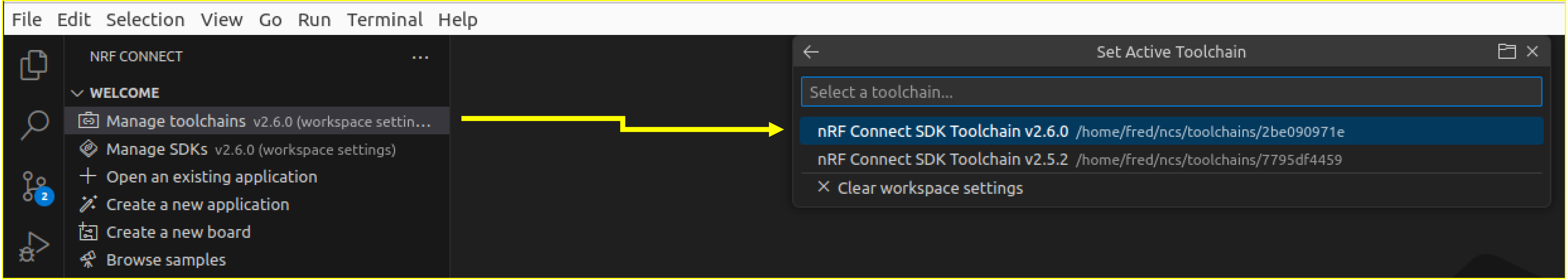
Install a toolchain to get started.

Install Toolchain

Install Toolchain

Select a toolchain to install...

- nRF Connect SDK Toolchain v2.5.2
- nRF Connect SDK Toolchain v2.5.1
- nRF Connect SDK Toolchain v2.5.0
- nRF Connect SDK Toolchain v2.4.3
- nRF Connect SDK Toolchain v2.4.2
- nRF Connect SDK Toolchain v2.4.1
- nRF Connect SDK Toolchain v2.4.0
- nRF Connect SDK Toolchain v2.3.0
- nRF Connect SDK Toolchain v2.2.0
- nRF Connect SDK Toolchain v2.1.3



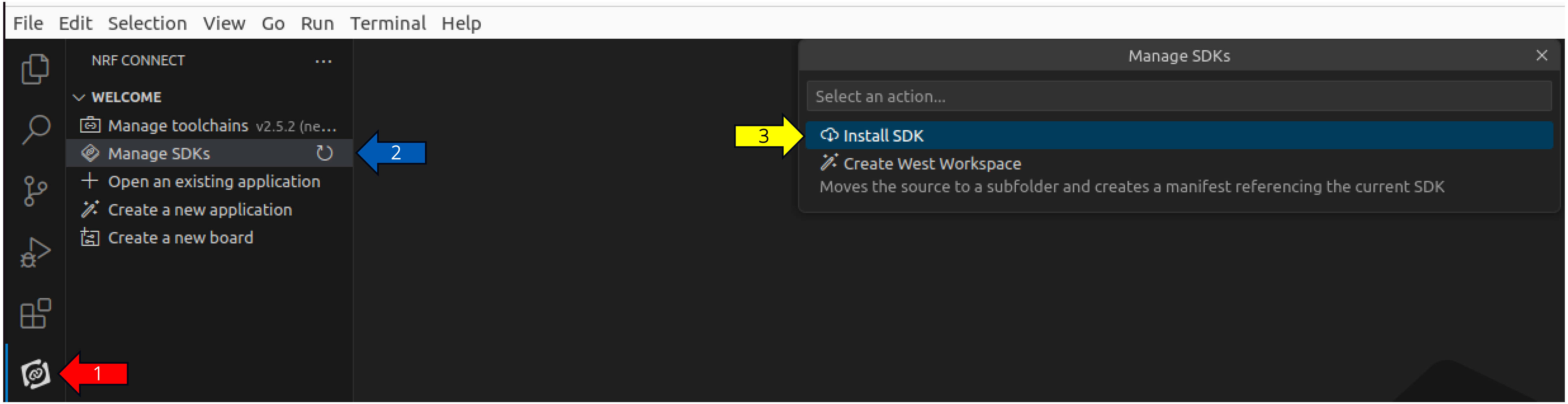
- Manage toolchains v2.6.0 (workspace settin...
- Manage SDKs v2.6.0 (workspace settings)
- Open an existing application
- Create a new application
- Create a new board
- Browse samples

Set Active Toolchain

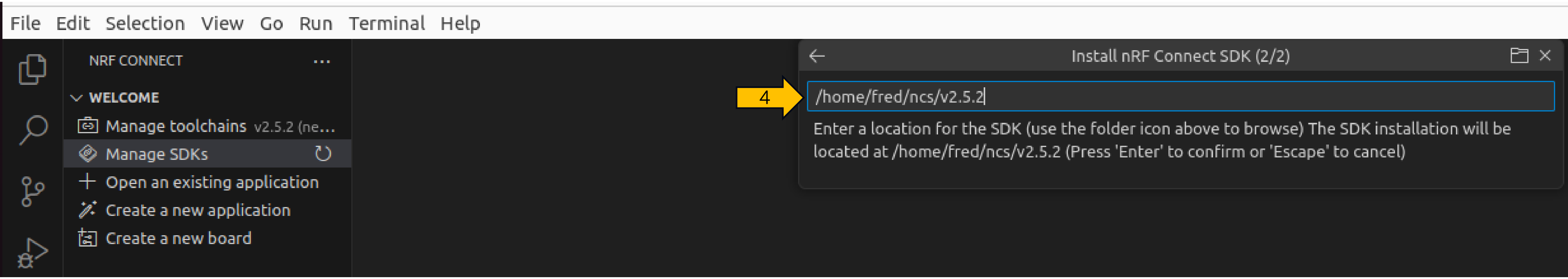
Select a toolchain...

- nRF Connect SDK Toolchain v2.6.0 /home/fred/ncs/toolchains/2be090971e
- nRF Connect SDK Toolchain v2.5.2 /home/fred/ncs/toolchains/7795df4459
- ✕ Clear workspace settings

Get the nRF Connect SDK Code



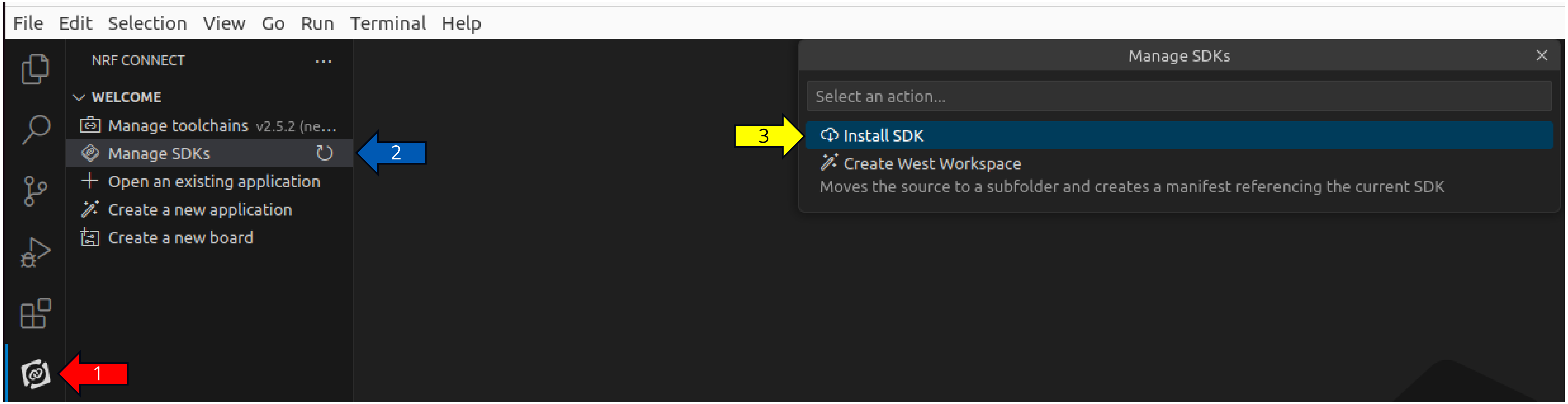
Moves the source to a subfolder and creates a manifest referencing the current SDK


File Edit Selection View Go Run Terminal Help
NRF CONNECT ...
WELCOME
Manage toolchains v2.5.2 (ne...
Manage SDKs
Open an existing application
Create a new application
Create a new board
4
Install nRF Connect SDK (2/2)

/home/fred/ncs/v2.5.2

Enter a location for the SDK (use the folder icon above to browse) The SDK installation will be located at /home/fred/ncs/v2.5.2 (Press 'Enter' to confirm or 'Escape' to cancel)

Select/Install the Desired nRF Connect SDK Code

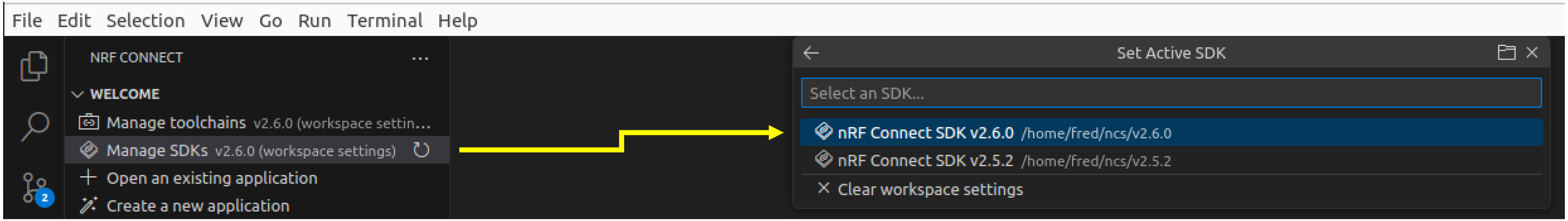


Select an action...

Install SDK

Create West Workspace

Moves the source to a subfolder and creates a manifest referencing the current SDK



File
Edit
Selection
View
Go
Run
Terminal
Help
NRF CONNECT
WELCOME
Manage toolchains v2.6.0 (workspace settin...
Manage SDKs v2.6.0 (workspace settings)
Open an existing application
Create a new application
Set Active SDK
2

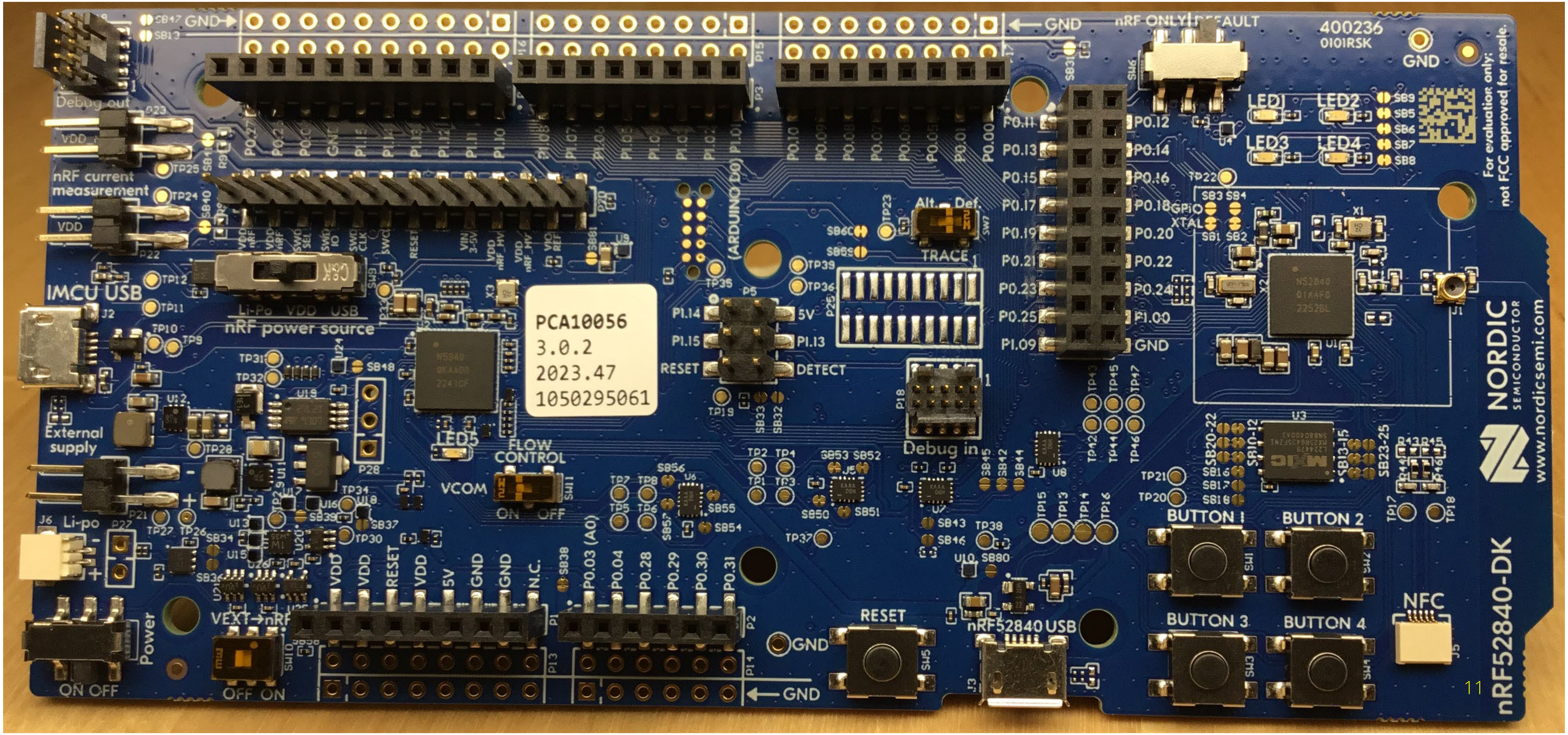
Select an SDK...

nRF Connect SDK v2.6.0 /home/fred/ncs/v2.6.0

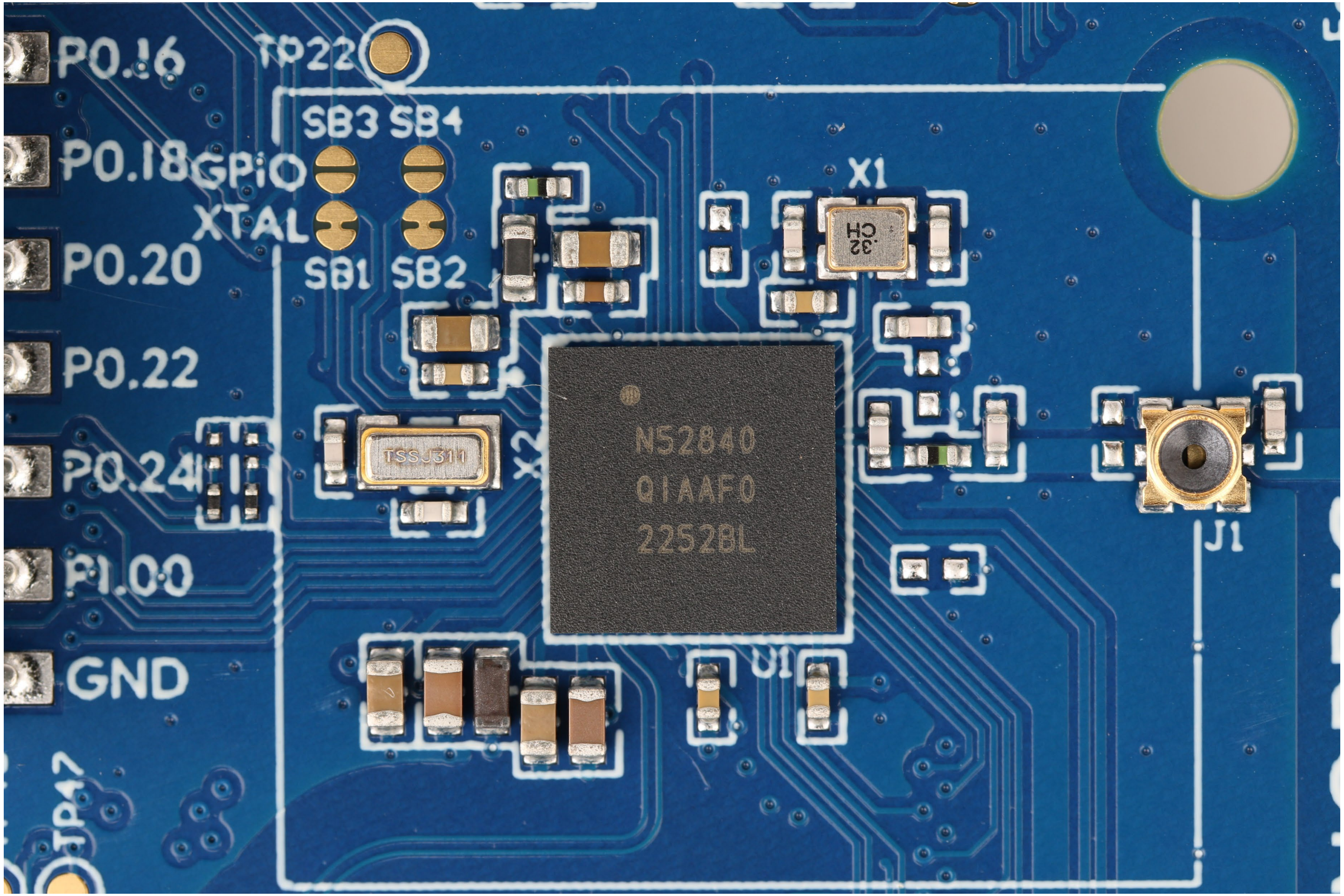
nRF Connect SDK v2.5.2 /home/fred/ncs/v2.5.2

Clear workspace settings

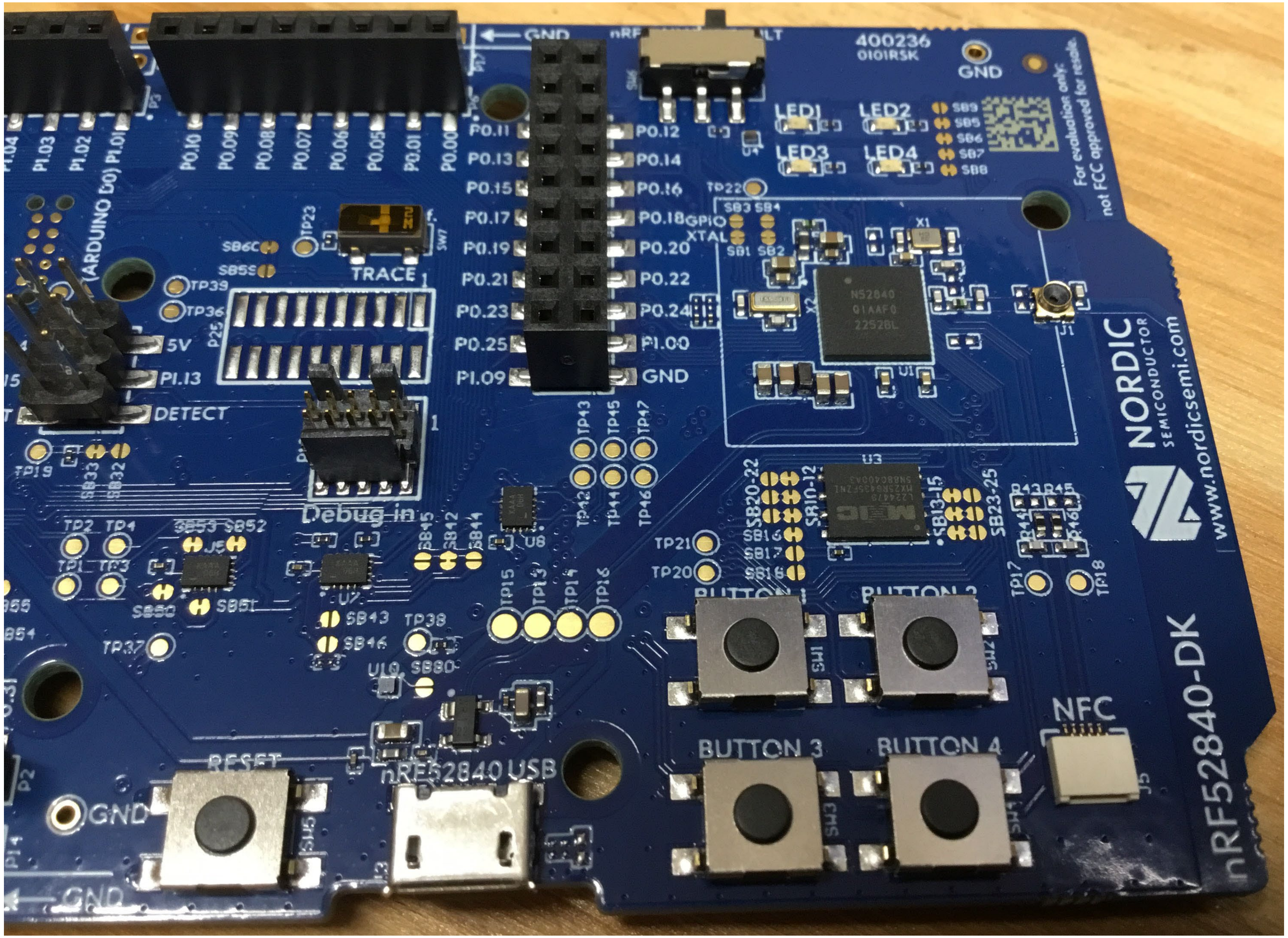
nRF52840 DK


GND
Debug out
VDD
nRF current measurement
VDD
IMCU USB
Li-Po VDD USB
nRF power source
External supply
Li-po
Power
ON OFF
VEXT→nRF
OFF ON
LED5
FLOW CONTROL
VCOM
ON OFF
PCA10056
3.0.2
2023.47
1050295061
VDD
VDD
RESET
VDD
5V
GND
GND
N.C.
P0.03 (A0)
P0.04
P0.28
P0.29
P0.30
P0.31
(ARDUINO D0) P1.01
P1.14
P1.15
RESET
5V
P1.13
DETECT
Alt. Def.
TRACE
Debug in
RESET
GND
nRF52840 USB
←GND
GND
nRF ONLY | DEFAULT
400236
0101RSK
P0.11
P0.13
P0.15
P0.17
P0.19
P0.21
P0.23
P0.25
P1.09
P0.12
P0.14
P0.16
P0.18
P0.20
P0.22
P0.24
P1.00
GND
LED1
LED2
LED3
LED4
GPIO
XTAL
BUTTON 1
BUTTON 2
BUTTON 3
BUTTON 4
NFC
For evaluation only; not FCC approved for resale.
NORDIC SEMICONDUCTOR
www.nordicsemi.com
nRF52840-DK

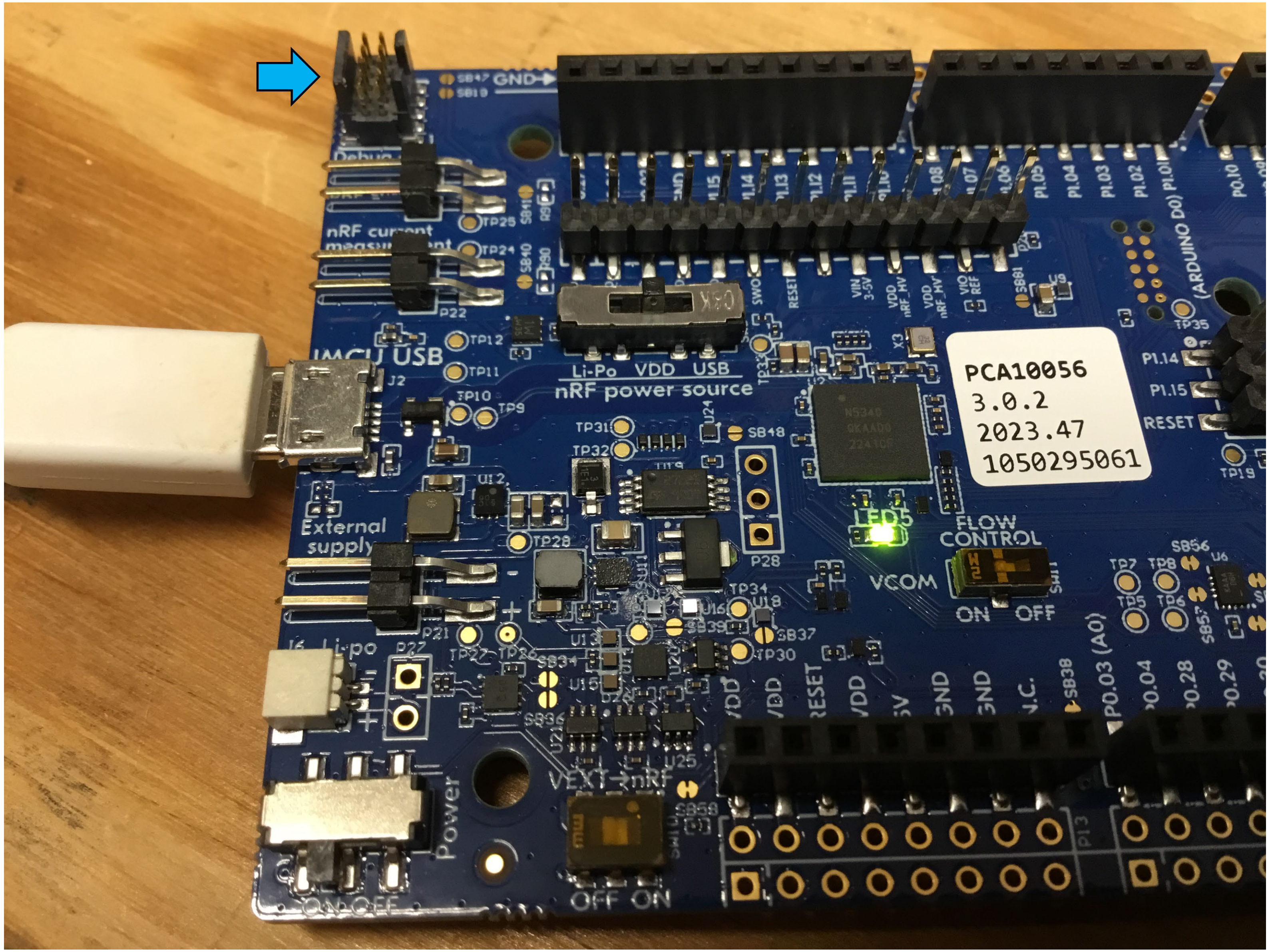
nRF52840 DK


P0.16
TP22
SB3 SB4
P0.18
GPIO
XTAL
SB1 SB2
P0.20
P0.22
P0.24
P1.00
GND
TP47
X1
CH .32
X2
TSSJ311
N52840
QIAAF0
2252BL
U1
J1

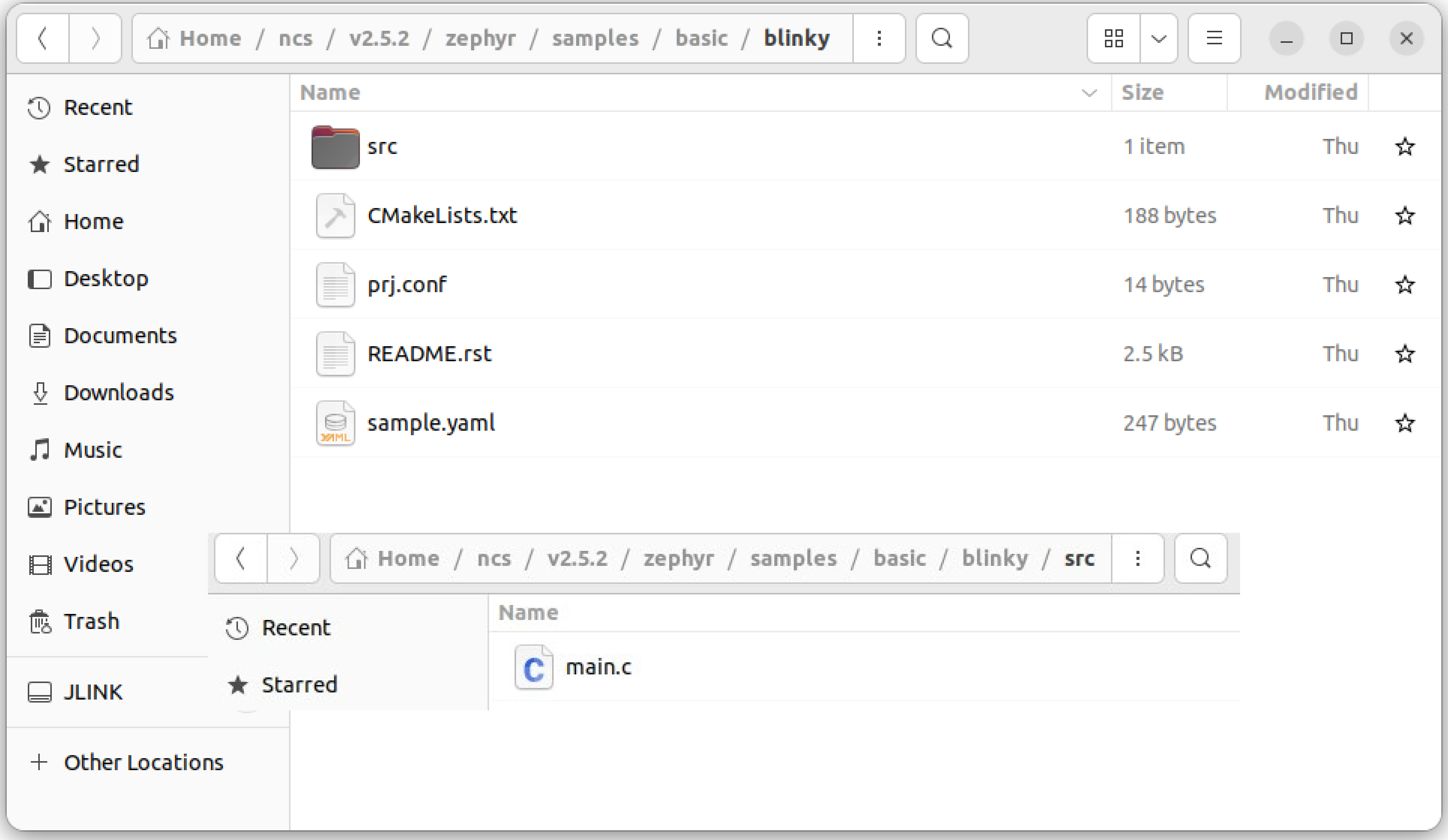
nRF52840 DK


LED1
LED2
LED3
LED4
GND
For evaluation only; not FCC approved for resale.
TRACE
Debug in
DETECT
5V
NORDIC SEMICONDUCTOR
www.nordicsemi.com
BUTTON 1
BUTTON 2
BUTTON 3
BUTTON 4
NFC
RESET
nRF52840 USB
nRF52840-DK

nRF52840 DK


GND
nRF current measurement
P22
MCU USB
J2
External supply
Li-po
Li-Po VDD USB
nRF power source
LED5
FLOW CONTROL
VCOM
ON OFF
PCA10056
3.0.2
2023.47
1050295061
P1.14
P1.15
RESET
(ARDUINO D0) P1.01
P0.03 (A0)
VEXT→nRF
Power
OFF ON
ON OFF

blinky Example



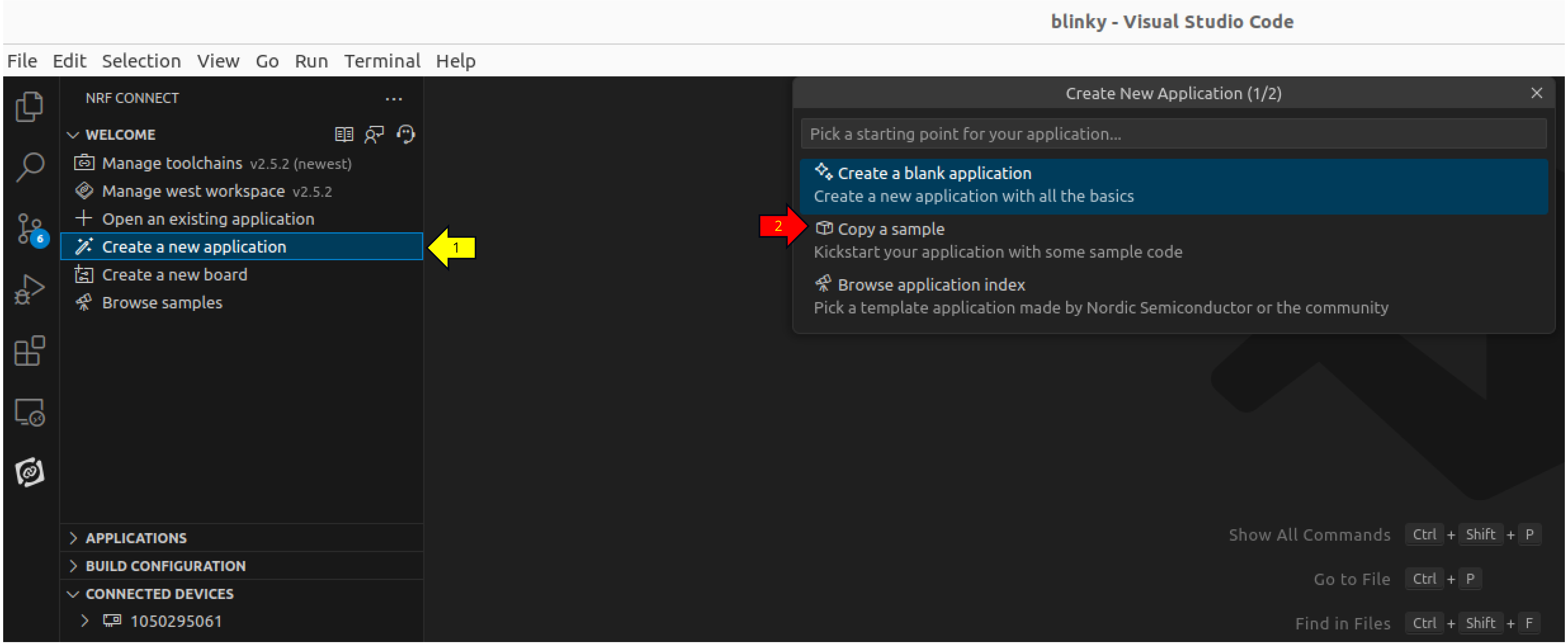
Home / ncs / v2.5.2 / zephyr / samples / basic / blinky

Name	Size	Modified
src	1 item	Thu
CMakeLists.txt	188 bytes	Thu
prj.conf	14 bytes	Thu
README.rst	2.5 kB	Thu
sample.yaml	247 bytes	Thu

Home / ncs / v2.5.2 / zephyr / samples / basic / blinky / src

Name
main.c

Load the *blinky* Example



blinky - Visual Studio Code

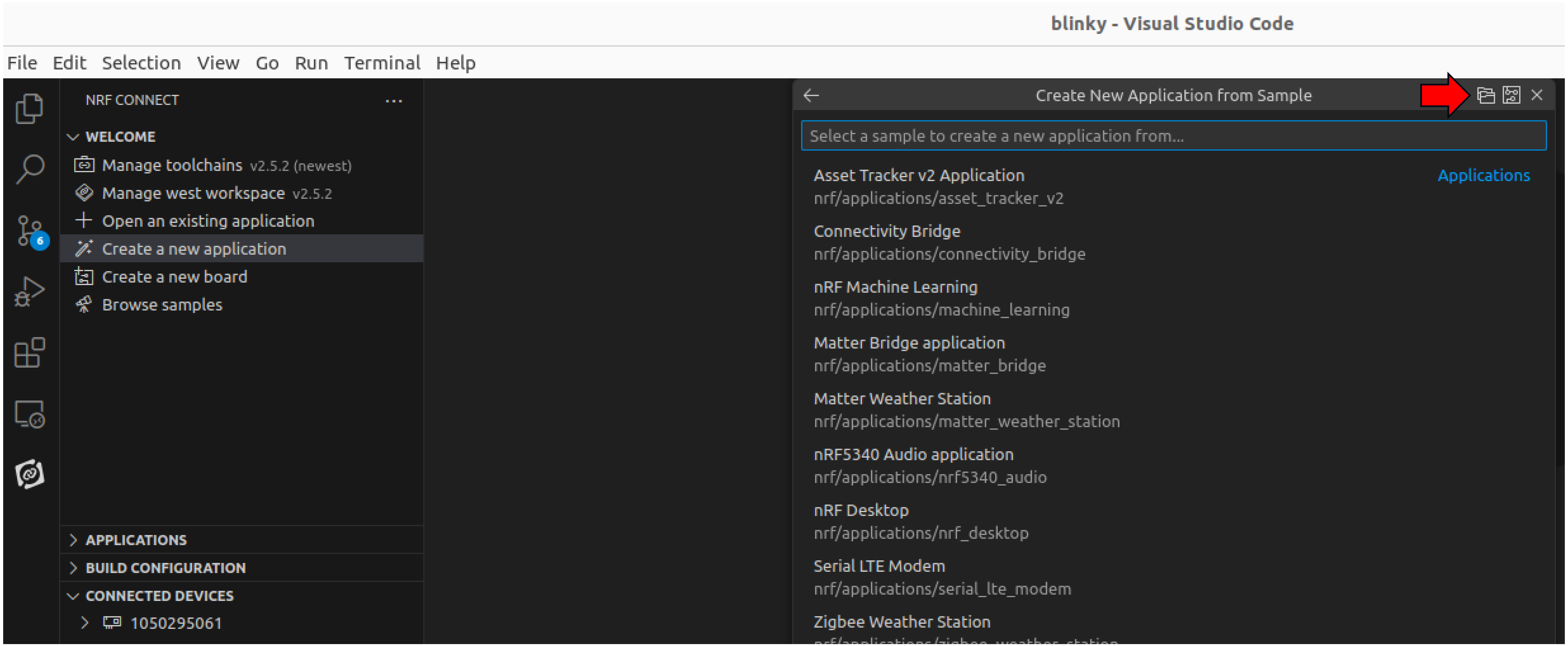
File Edit Selection View Go Run Terminal Help
NRF CONNECT
WELCOME
Manage toolchains v2.5.2 (newest)
Manage west workspace v2.5.2
Open an existing application
Create a new application
Create a new board
Browse samples
1
APPLICATIONS
BUILD CONFIGURATION
CONNECTED DEVICES
1050295061
Create New Application (1/2)
Pick a starting point for your application...
2
Show All Commands Ctrl + Shift + P
Go to File Ctrl + P
Find in Files Ctrl + Shift + F

Create a blank application
Create a new application with all the basics

Copy a sample
Kickstart your application with some sample code

Browse application index
Pick a template application made by Nordic Semiconductor or the community

Load the *blinky* Example


blinky - Visual Studio Code
File Edit Selection View Go Run Terminal Help
NRF CONNECT
WELCOME
Manage toolchains v2.5.2 (newest)
Manage west workspace v2.5.2
Open an existing application
Create a new application
Create a new board
Browse samples
APPLICATIONS
BUILD CONFIGURATION
CONNECTED DEVICES
1050295061
Create New Application from Sample
Select a sample to create a new application from...
Applications

Asset Tracker v2 Application
nrf/applications/asset_tracker_v2

Connectivity Bridge
nrf/applications/connectivity_bridge

nRF Machine Learning
nrf/applications/machine_learning

Matter Bridge application
nrf/applications/matter_bridge

Matter Weather Station
nrf/applications/matter_weather_station

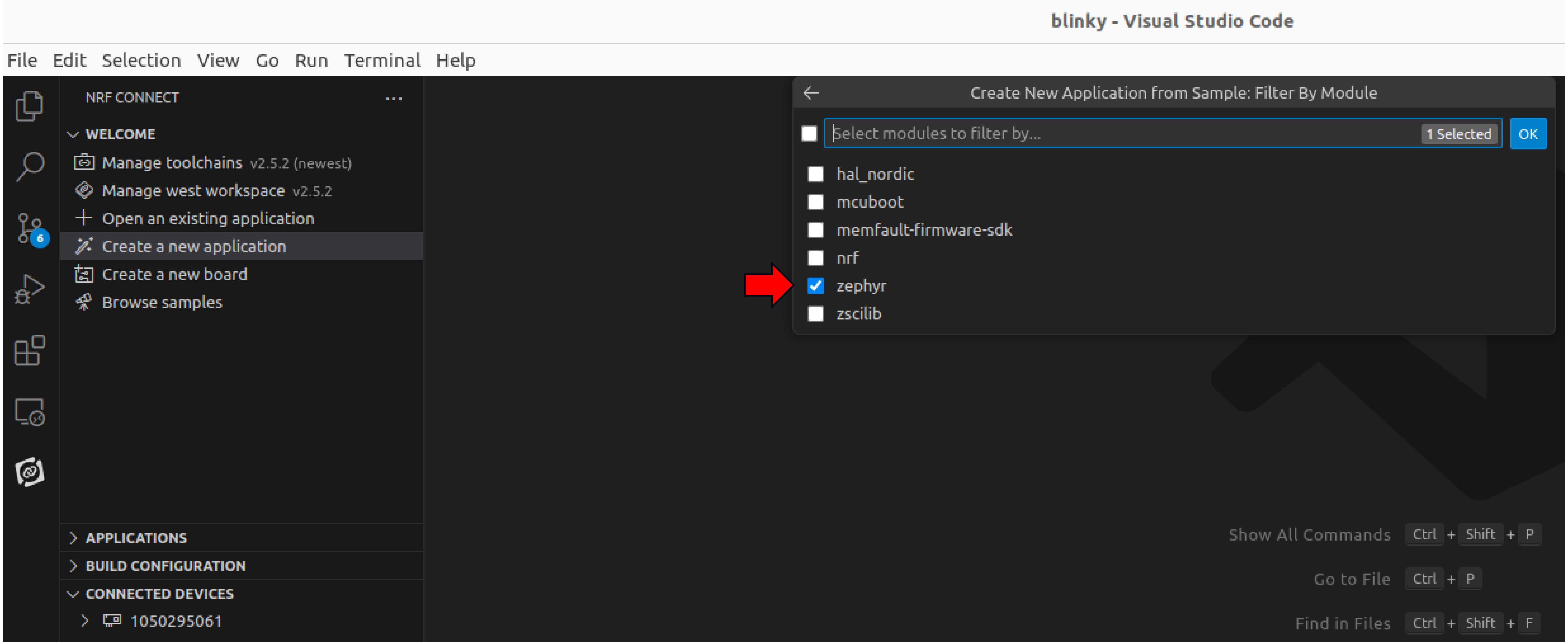
nRF5340 Audio application
nrf/applications/nrf5340_audio

nRF Desktop
nrf/applications/nrf_desktop

Serial LTE Modem
nrf/applications/serial_lte_modem

Zigbee Weather Station
nrf/applications/zigbee_weather_station

Load the *blinky* Example



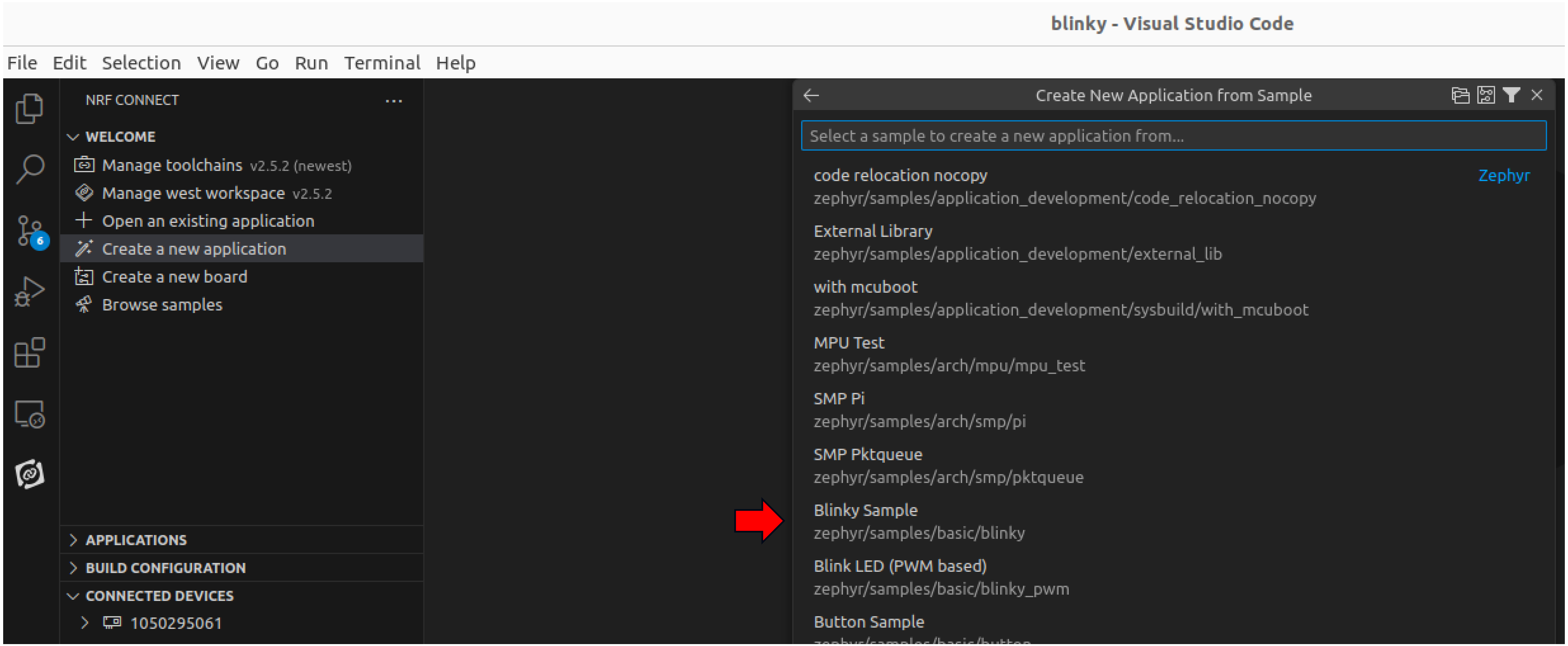
blinky - Visual Studio Code

Create New Application from Sample: Filter By Module

□ Select modules to filter by... 1 Selected OK

- □ hal_nordic
- □ mcuboot
- □ memfault-firmware-sdk
- □ nrf
- ☑ zephyr
- □ zscilib

Load the *blinky* Example



blinky - Visual Studio Code

File Edit Selection View Go Run Terminal Help

Create New Application from Sample

Select a sample to create a new application from...

code relocation nocopy — Zephyr
zephyr/samples/application_development/code_relocation_nocopy

External Library
zephyr/samples/application_development/external_lib

with mcuboot
zephyr/samples/application_development/sysbuild/with_mcuboot

MPU Test
zephyr/samples/arch/mpu/mpu_test

SMP Pi
zephyr/samples/arch/smp/pi

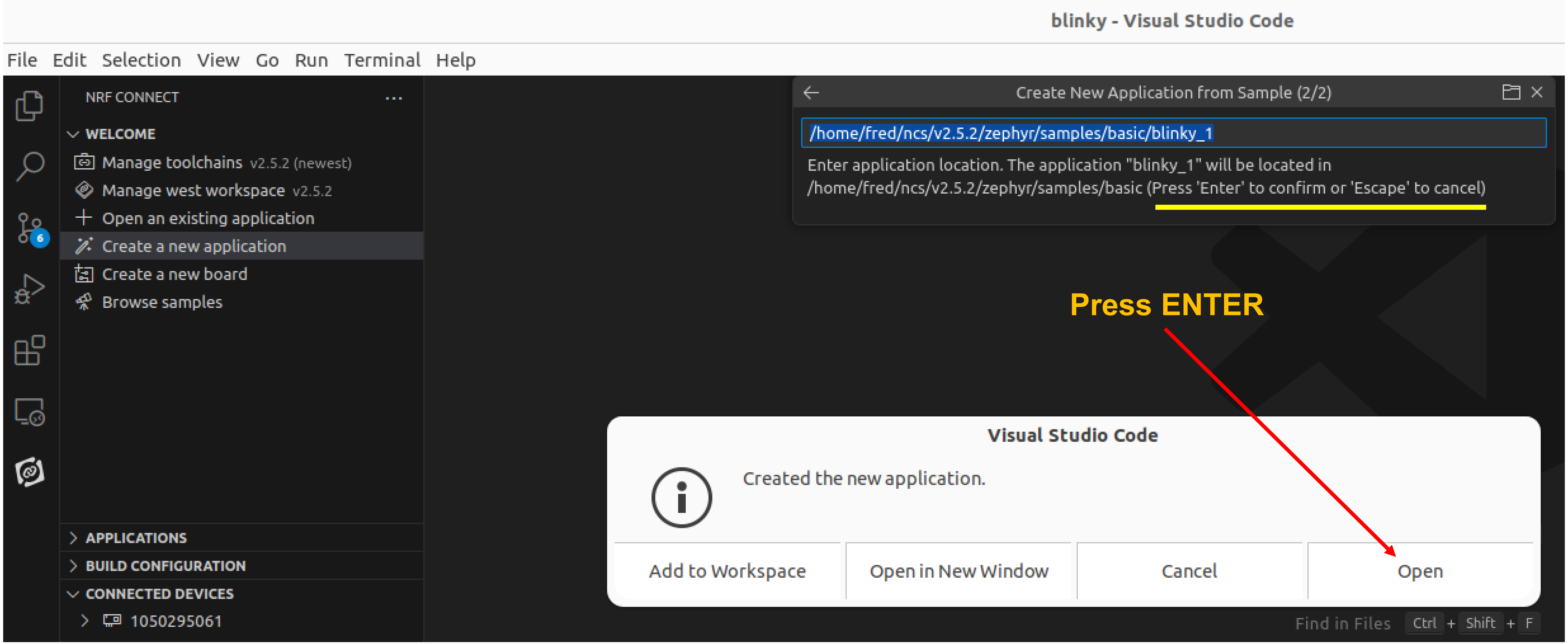
SMP Pktqueue
zephyr/samples/arch/smp/pktqueue

Blinky Sample
zephyr/samples/basic/blinky

Blink LED (PWM based)
zephyr/samples/basic/blinky_pwm

Button Sample
zephyr/samples/basic/button

Load the *blinky* Example


blinky - Visual Studio Code
File Edit Selection View Go Run Terminal Help
NRF CONNECT
WELCOME
Manage toolchains v2.5.2 (newest)
Manage west workspace v2.5.2
Open an existing application
Create a new application
Create a new board
Browse samples
APPLICATIONS
BUILD CONFIGURATION
CONNECTED DEVICES
1050295061
Create New Application from Sample (2/2)
Add to Workspace
Open in New Window
Cancel
Open
Find in Files Ctrl + Shift + F

/home/fred/ncs/v2.5.2/zephyr/samples/basic/blinky_1

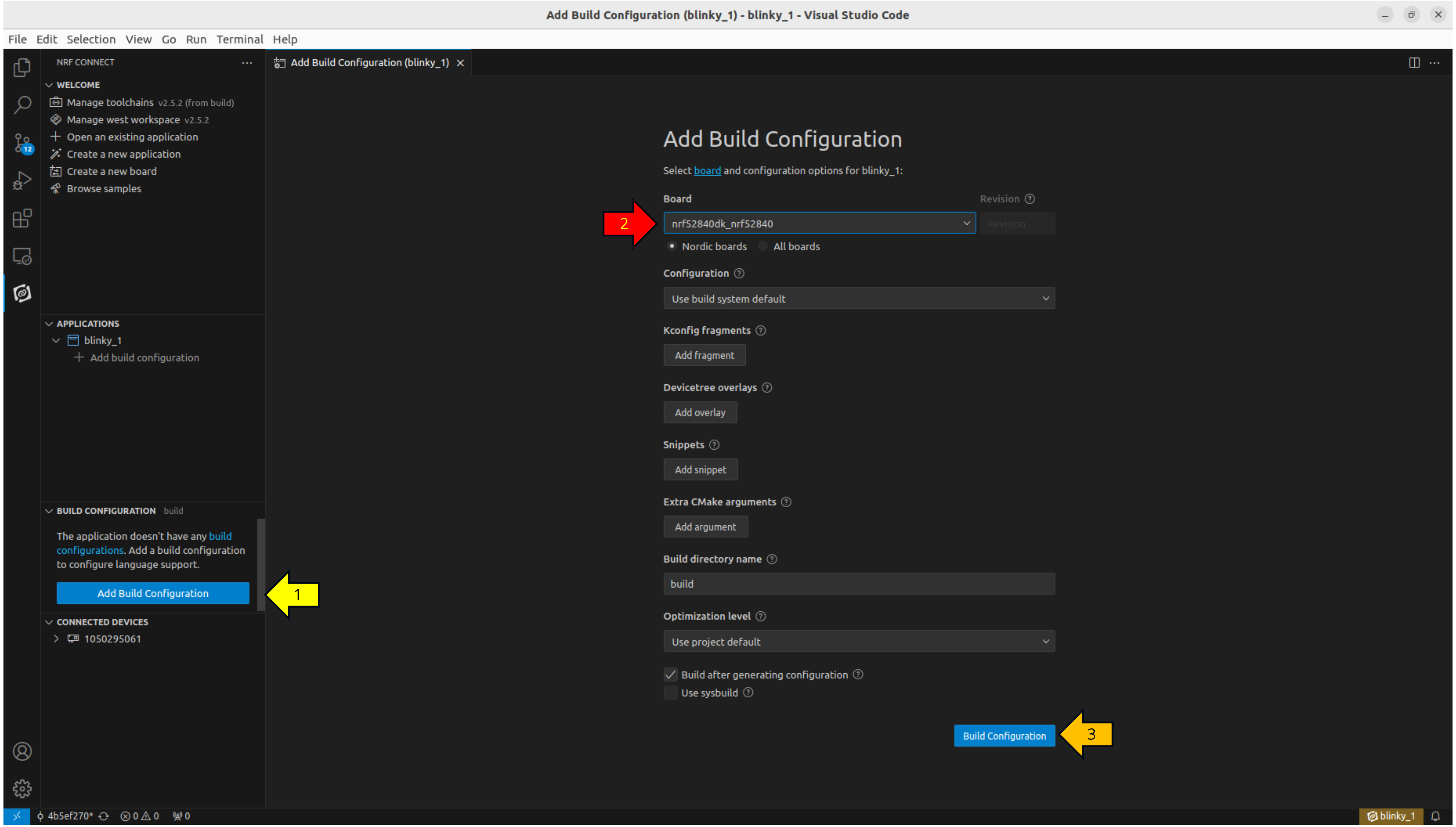
Enter application location. The application "blinky_1" will be located in /home/fred/ncs/v2.5.2/zephyr/samples/basic (Press 'Enter' to confirm or 'Escape' to cancel)

Visual Studio Code

Created the new application.

Press ENTER

Load the *blinky* Example


Add Build Configuration (blinky_1) - blinky_1 - Visual Studio Code
File Edit Selection View Go Run Terminal Help
NRF CONNECT
WELCOME
Manage toolchains v2.5.2 (from build)
Manage west workspace v2.5.2
Open an existing application
Create a new application
Create a new board
Browse samples
APPLICATIONS
blinky_1
Add build configuration
BUILD CONFIGURATION build
CONNECTED DEVICES
1050295061
Add Build Configuration (blinky_1)
Add fragment
Add overlay
Add snippet
Add argument
4b5ef270* ⊗0 ⚠0 ⊗0
blinky_1
1
2
3

The application doesn't have any build configurations. Add a build configuration to configure language support.

1 → Add Build Configuration

Add Build Configuration

Select board and configuration options for blinky_1:

2 → Board: nrf52840dk_nrf52840

Revision: Revision

● Nordic boards ○ All boards

Configuration: Use build system default

Kconfig fragments

Devicetree overlays

Snippets

Extra CMake arguments

Build directory name: build

Optimization level: Use project default

☑ Build after generating configuration

□ Use sysbuild

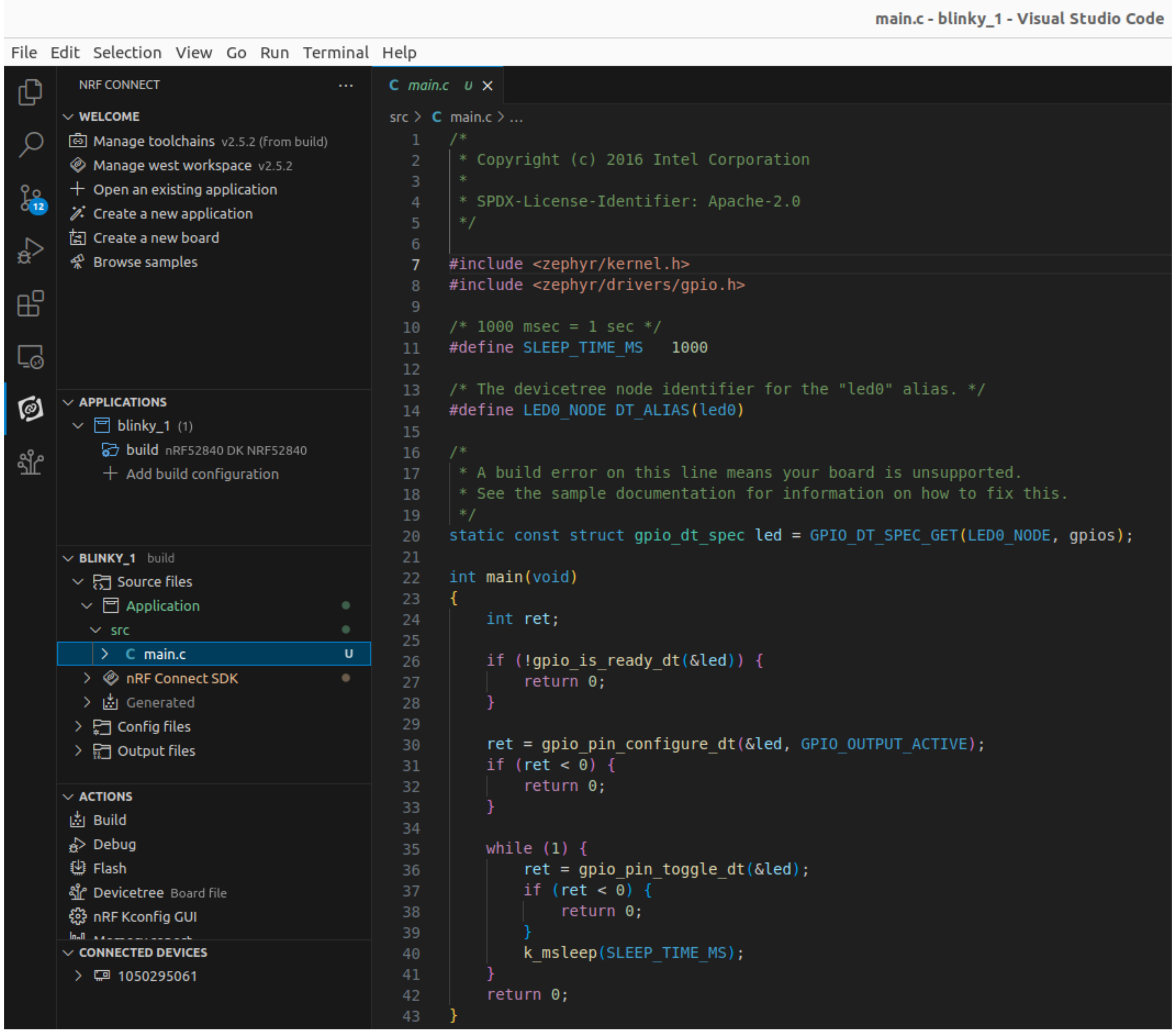
3 → Build Configuration

Developing IoT Applications with Nordic nRF Modules

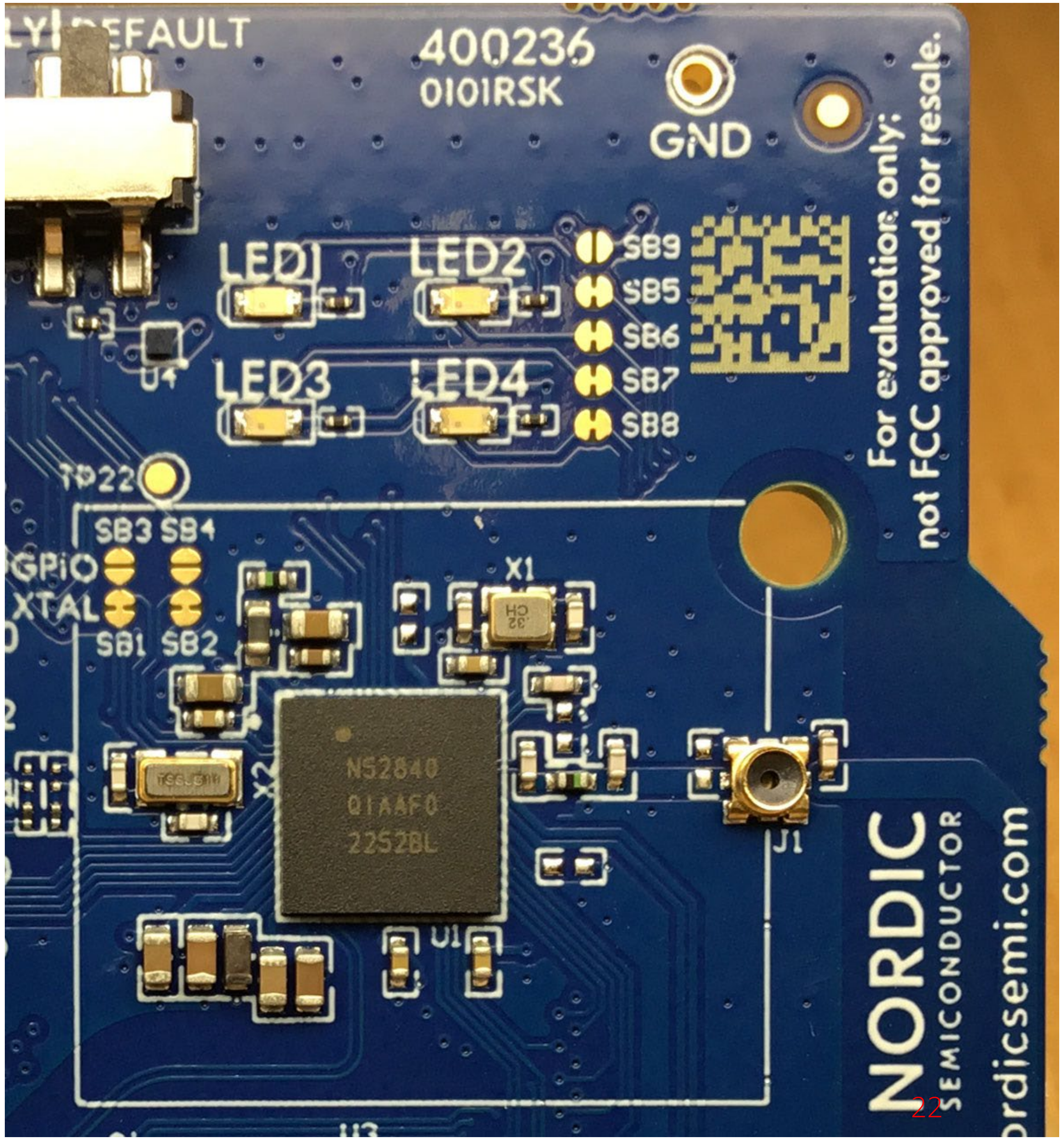
Install and Configure the nRF Connect SDK

Build, Flash and Run *blinky*

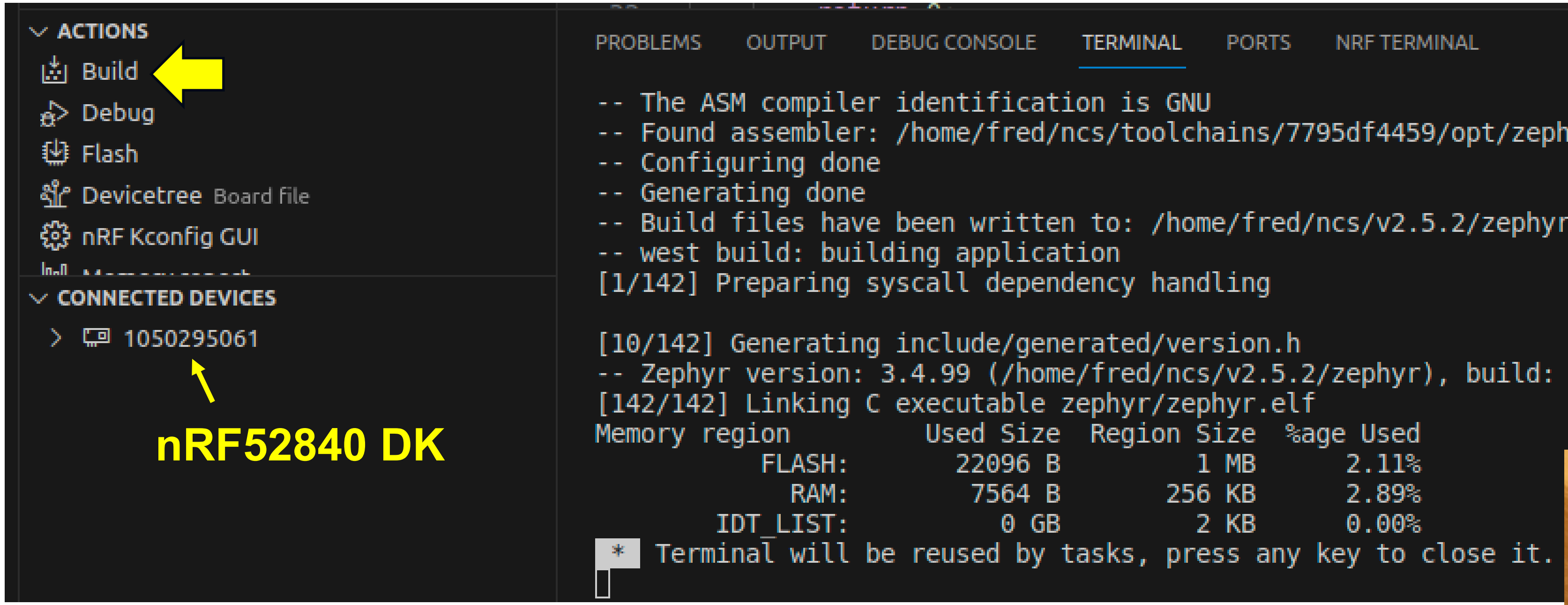
Edit *blinky*



```c
/*
 * Copyright (c) 2016 Intel Corporation
 *
 * SPDX-License-Identifier: Apache-2.0
 */

#include <zephyr/kernel.h>
#include <zephyr/drivers/gpio.h>

/* 1000 msec = 1 sec */
#define SLEEP_TIME_MS   1000

/* The devicetree node identifier for the "led0" alias. */
#define LED0_NODE DT_ALIAS(led0)

/*
 * A build error on this line means your board is unsupported.
 * See the sample documentation for information on how to fix this.
 */
static const struct gpio_dt_spec led = GPIO_DT_SPEC_GET(LED0_NODE, gpios);

int main(void)
{
    int ret;

    if (!gpio_is_ready_dt(&led)) {
        return 0;
    }

    ret = gpio_pin_configure_dt(&led, GPIO_OUTPUT_ACTIVE);
    if (ret < 0) {
        return 0;
    }

    while (1) {
        ret = gpio_pin_toggle_dt(&led);
        if (ret < 0) {
            return 0;
        }
        k_msleep(SLEEP_TIME_MS);
    }
    return 0;
}
```

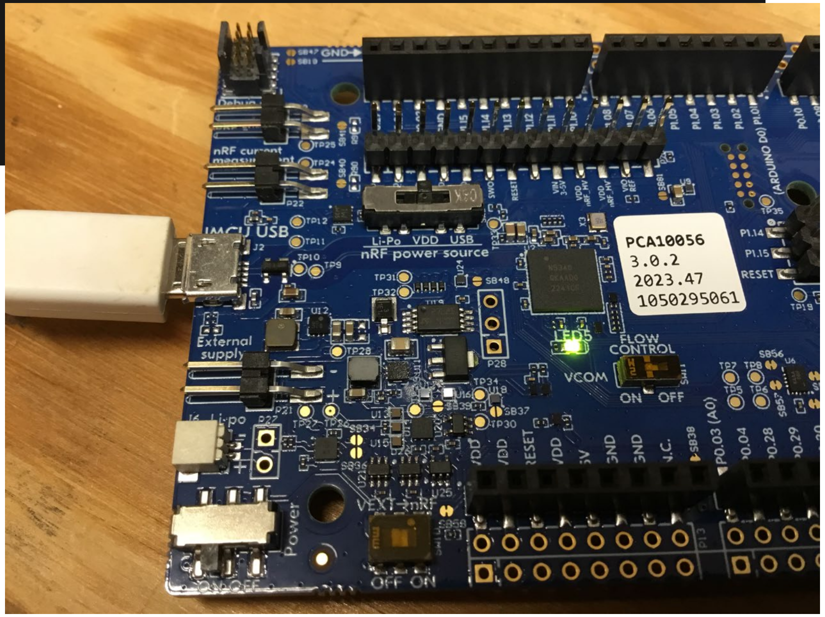


Build *blinky*

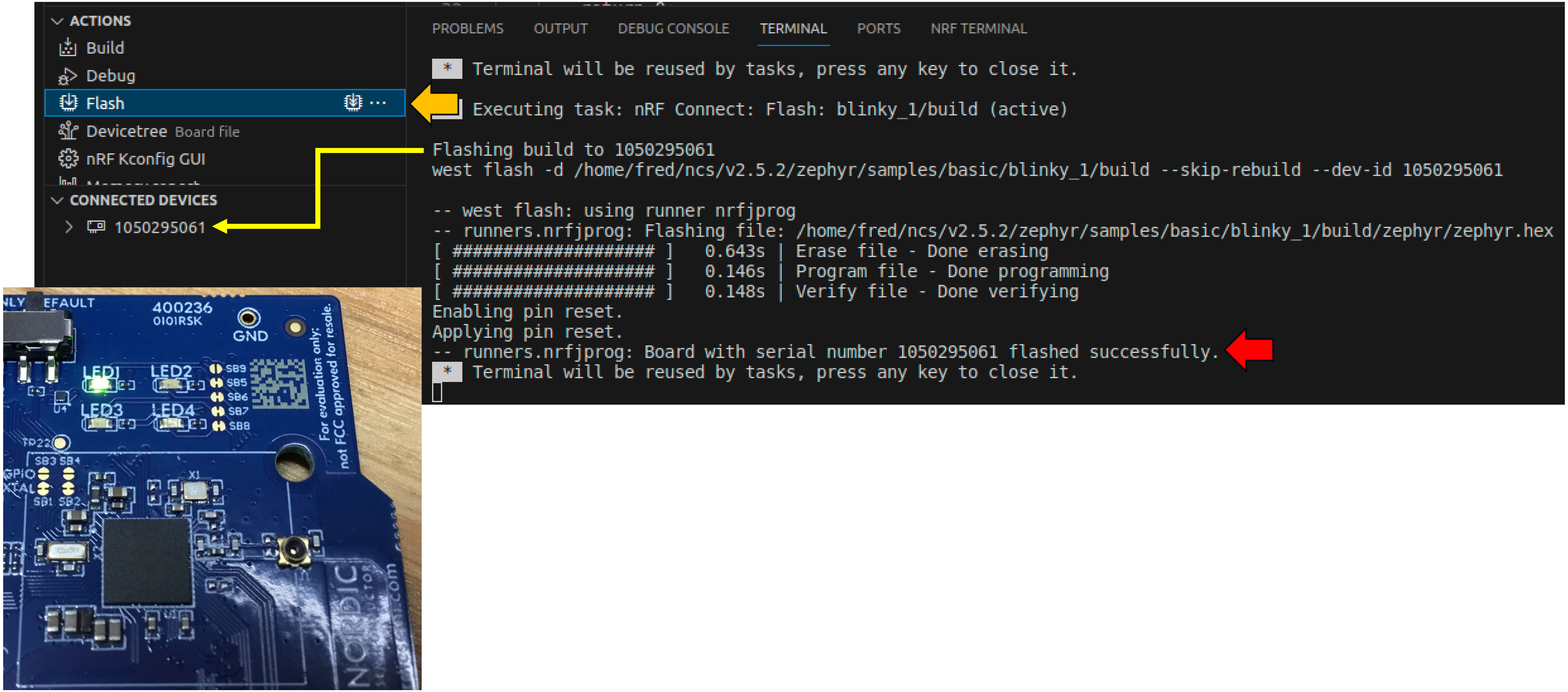


```
-- The ASM compiler identification is GNU
-- Found assembler: /home/fred/ncs/toolchains/7795df4459/opt/zephyr-sdk/arm-zephyr-eabi/bin/arm-zephyr-eabi-gcc
-- Configuring done
-- Generating done
-- Build files have been written to: /home/fred/ncs/v2.5.2/zephyr/samples/basic/blinky_1/build
-- west build: building application
[1/142] Preparing syscall dependency handling

[10/142] Generating include/generated/version.h
-- Zephyr version: 3.4.99 (/home/fred/ncs/v2.5.2/zephyr), build: 4b5ef270413a
[142/142] Linking C executable zephyr/zephyr.elf
Memory region         Used Size  Region Size  %age Used
           FLASH:       22096 B         1 MB      2.11%
             RAM:        7564 B       256 KB      2.89%
        IDT_LIST:          0 GB         2 KB      0.00%
 *  Terminal will be reused by tasks, press any key to close it.
```

nRF52840 DK



Flash and Run *blinky*



```
 *  Terminal will be reused by tasks, press any key to close it.

    Executing task: nRF Connect: Flash: blinky_1/build (active)

Flashing build to 1050295061
west flash -d /home/fred/ncs/v2.5.2/zephyr/samples/basic/blinky_1/build --skip-rebuild --dev-id 1050295061

-- west flash: using runner nrfjprog
-- runners.nrfjprog: Flashing file: /home/fred/ncs/v2.5.2/zephyr/samples/basic/blinky_1/build/zephyr/zephyr.hex
[ #################### ]   0.643s | Erase file - Done erasing
[ #################### ]   0.146s | Program file - Done programming
[ #################### ]   0.148s | Verify file - Done verifying
Enabling pin reset.
Applying pin reset.
-- runners.nrfjprog: Board with serial number 1050295061 flashed successfully.
 *  Terminal will be reused by tasks, press any key to close it.
```

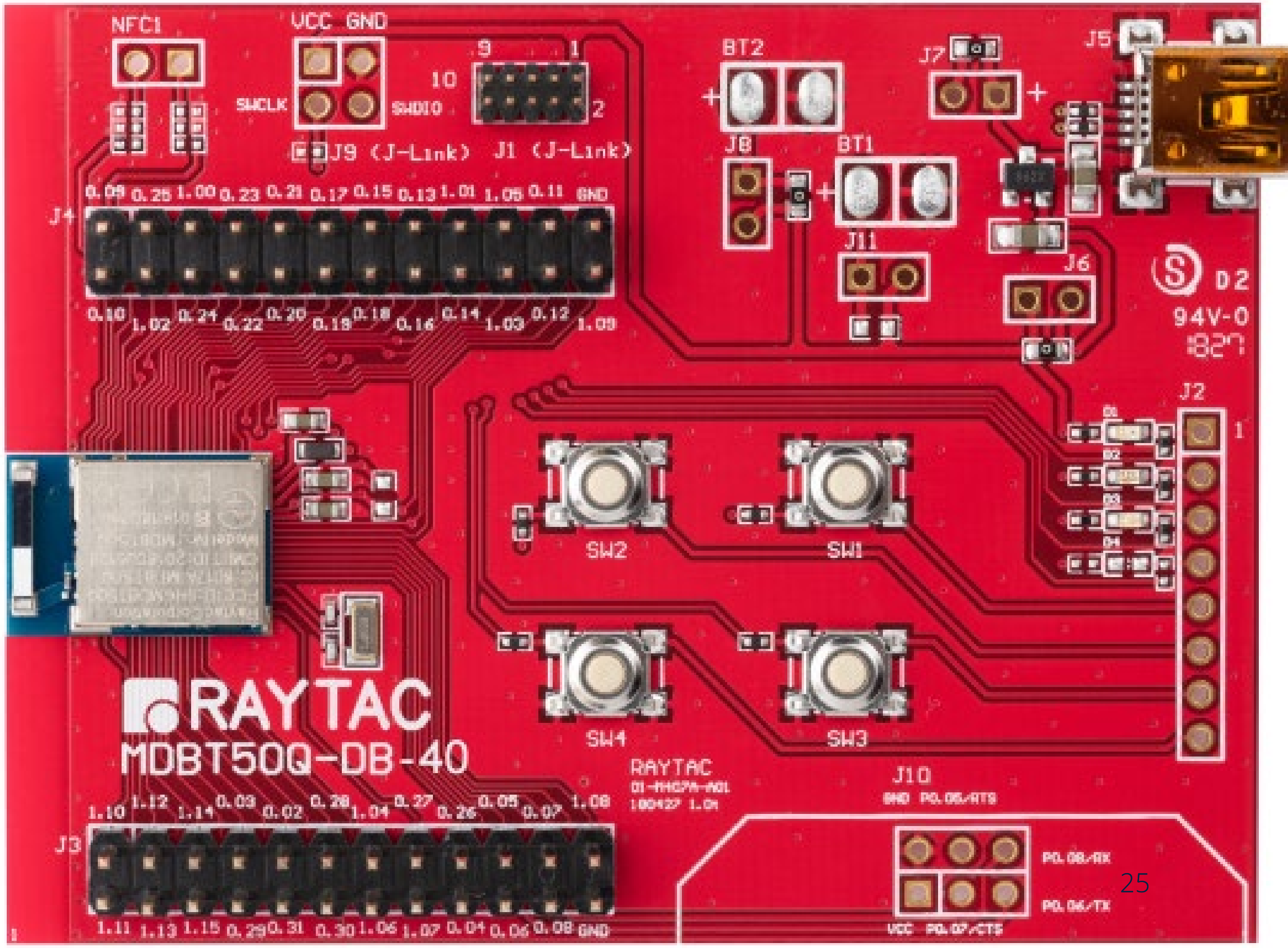
Next Time…

MORE TO COME..

Thank you for attending!!!

Please consider the resources below:

- Today’s Download Package
- nordicsemi.com
- nRF52840 User Guide



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