

nRF Connect Trace Collector

v1.1.3

User Guide

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Revision history

Date	Description
2022-09-27	Added instructions for tracing on a custom board
2022-09-06	Updated images and text for new user interface in nRF Connect Programmer v1.1.2
2022-02-21	Updated: <ul style="list-style-type: none">• Preparing the board for trace collection on page 8• Enabling tracing in the application on page 8
2021-07-07	Updated Preparing the board for trace collection on page 8
2021-04-23	First release

Previous versions

PDF files for relevant previous versions are available here:

- [nRF Connect Trace Collector User Guide v1.0.7](#) (corresponds to nRF Connect Trace Collector v1.0.7)

1 Introduction

nRF Connect Trace Collector is a cross-platform tool to capture trace files of the nRF9160 modem.

The tool collects *Universal Asynchronous Receiver/Transmitter (UART)* traces from the nRF9160 *System in Package (SiP)* over the serial port. If you run into problems when developing and debugging your application, Nordic Semiconductor's support team might ask you to provide these binary trace files to analyze the communication between the device and the LTE network.

The Trace Collector is implemented as an app for the [nRF Connect for Desktop](#) application.

Supported devices

- nRF9160 DK (PCA10090)
- Nordic Thingy:91™ (PCA20035)

You can also collect traces on a custom board that is based on the nRF9160 SiP.

2 Installing the Trace Collector app

Trace Collector is installed as an app for nRF Connect for Desktop.

Before you can install the app, you must download and install [nRF Connect for Desktop](#) (version 3.2.0 or later).

To install the app:

1. Open nRF Connect for Desktop.
2. Find the Trace Collector in the list and click **Install**.

Once the app is installed, you can launch it by clicking **Open**.

For easy access, you can create a desktop shortcut by clicking the **arrow down** button and selecting **Create shortcut**.

If a new version of the app becomes available, an **Update** button is displayed next to the **Open** button. Click this button to install the latest version.

To uninstall the app, click the **arrow down** button and select **Uninstall**.

3 Overview and user interface

After starting the Trace Collector, the application window is displayed.

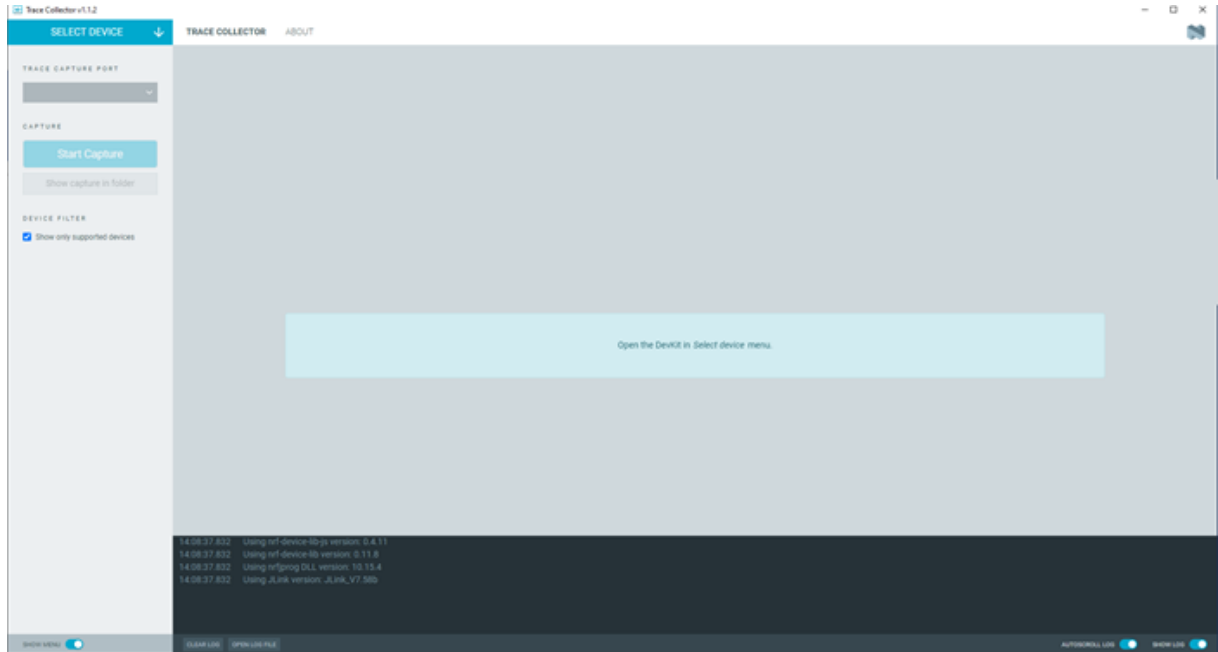


Figure 1: Main window of the Trace Collector app

The window contains the following elements:

Select Device

Once you connect a device to the system, it becomes visible and available for selection, when you click on **Select device** in the Navigation bar.

Side panel

The side panel lets you start capturing, and you can access the captured logs from here.

You can also configure the Trace Collector to automatically filter the connected devices to display only supported devices and ports.

Note: If you want to capture from Nordic Thingy:91, deselect **Show only supported devices** so that you can select the correct port.

You can switch between the following application Tabs, using the Navigation bar.

Trace Collector tab

When you select a device and start capturing, it displays information about the available disk space and the current trace file.

About tab

You can view application information, restore defaults, access source code, and documentation. You also can find information on the selected device, access support tools, and enable verbose logging.

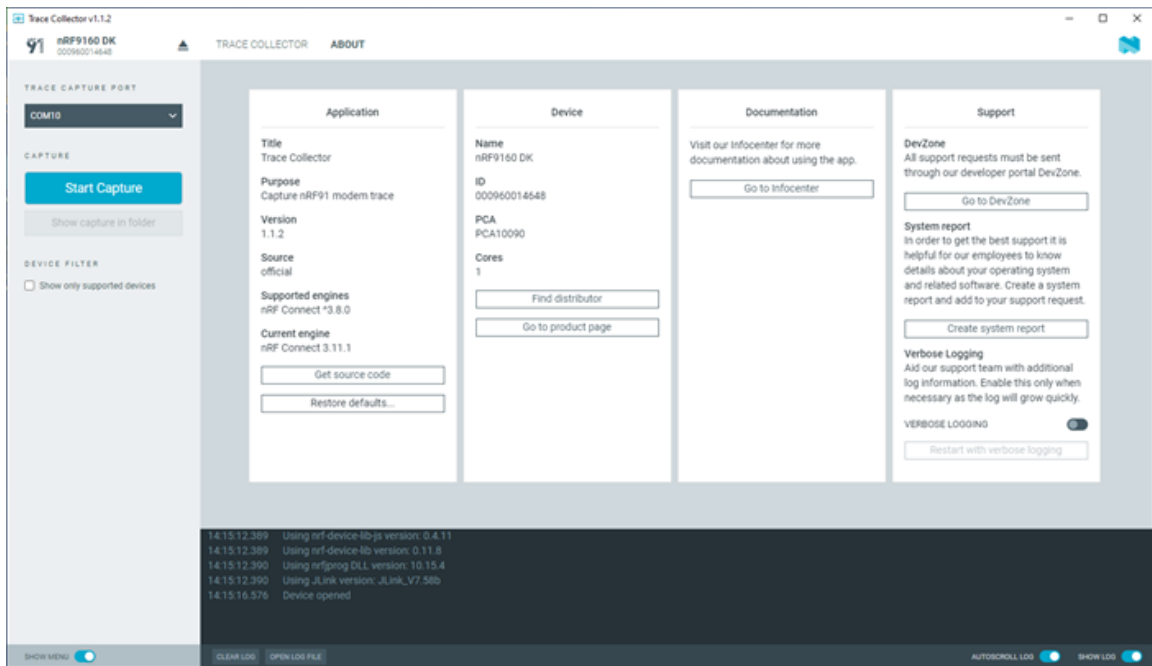


Figure 2: nRF Connect for Desktop Trace Collector About tab

Log

The Log panel allows you to view the most important log events, tagged with a timestamp. Each time you open the app, a new session log file is created. You can find the Log panel and its controls, below the main application Window.

- When troubleshooting, to view more detailed information than shown in the Log panel, use **Open log file** to open the current log file in a text editor.
- To clear the information currently displayed in the Log panel, use **Clear Log**. The contents of the log file are not affected.
- To hide or display the Log panel in the user interface, use **Show Log**.
- To freeze Log panel scrolling, use **Autoscroll Log**.

4

Collecting a modem trace for the nRF9160 DK

To collect a modem trace, you must ensure that you have the latest firmware for the board controller, update your application to enable tracing, and capture the trace while your application is running.

4.1 Preparing the board for trace collection

The Trace Collector requires a current version of the board controller firmware to be programmed on the nRF52840 *System on Chip (SoC)* of the nRF9160 DK.

Download the latest firmware from [nRF9160 DK Downloads](#) (scroll down to **Board controller firmware**).

Complete the following steps to program the board controller firmware:

1. Set the switch that configures which chip to program to the **nRF52** position.
This switch is labeled **PROG/DEBUG (SW10)** on nRF9160 DK v0.15.0 and later, **SW5** on earlier versions).
2. Connect your device to the computer with a *Universal Serial Bus (USB)* cable and power it on or reset it if it is already connected.
3. Program the downloaded firmware to your device.
 - To program the firmware with nRF Connect Programmer, follow the instructions in [Programming applications on nRF9160 DK](#).
 - To program from the command line, open a terminal window in the directory that contains the downloaded firmware and enter the following command (replace *filename.hex* with the file name of the downloaded firmware image):

```
nrfjprog --program filename.hex --sectorerase -f NRF52 -r --verify
```

Note: The `nrfjprog` tool, which is part of the [nRF Command Line Tools](#), must be installed and in the path.

4.2 Enabling tracing in the application

To capture a modem trace, you must configure your application to enable trace output over *UART*.

The following instructions assume that your application is based on the [nRF Connect SDK](#).

Note: By default, nRF Connect SDK's modem library uses the UART1 peripheral for trace output. This means that you cannot use UART1 for other purposes in your application. If this does not work for your application, you must update the configuration and code of the modem library to use a different UART peripheral for trace output.

Complete the following steps to enable tracing:

1. Set the `CONFIG_NRF_MODEM_LIB_TRACE` option in your application.
See [Configuring your application](#) for instructions on how to set this option temporarily or permanently.

Note:

- In nRF Connect SDK versions 1.5.0 - 2.0.0, the option was called `CONFIG_NRF_MODEM_LIB_TRACE_ENABLED`.
- In nRF Connect SDK v1.5.x, setting the option temporarily might cause a build error. In that case, set the option permanently in the `prj.conf` file.
- In nRF Connect SDK versions before 1.5.0, the option was called `CONFIG_BSD_LIBRARY_TRACE_ENABLED`.

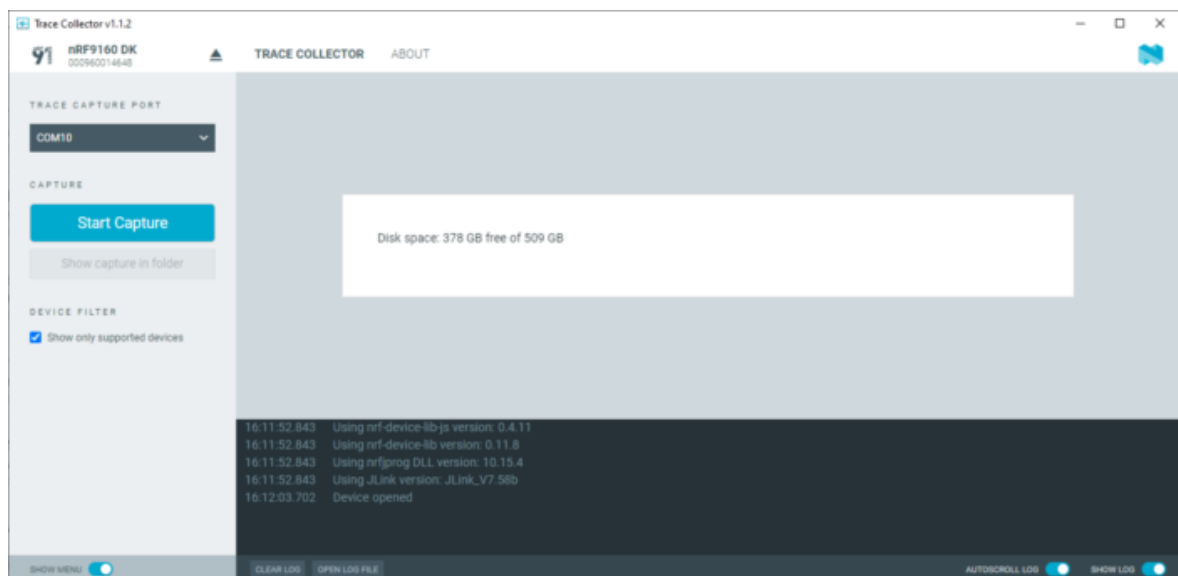
2. Set the switch that configures which chip to program to the **nRF91** position.
This switch is labeled **PROG/DEBUG (SW10)** on nRF9160 DK v0.15.0 and later, **SW5** on earlier versions).
3. Connect your device to the computer with a *USB* cable and power it on or reset it if it is already connected.
4. Build your application and program it to the device.
Follow the instructions in [Building and programming a sample application](#).

4.3 Capturing the modem trace

You can use Trace Collector to capture the modem trace after programming the required firmware.

Complete the following steps to start capturing:

1. Connect your device to the computer with a *USB* cable and power it on or reset it if it is already connected.
2. Check that your application is working as expected.
3. Open nRF Connect for Desktop and launch the Trace Collector app.
4. Select your device from the drop-down list.



5. Click the **Start Capture** button in the side panel.
You can see the status in the main view. When the modem is active, the size of the trace file should be increasing.
6. Click **Show capture in folder** to access the trace file.
By default, the trace files are stored in `C:\Users\username\AppData\Roaming\nrfconnect\pc-nrfconnect-tracecollector\`.
7. Click **Stop Capture** to stop capturing.

- You can view the current trace filename, file size and free disk space, in the Trace Collector tab.
- You can access the trace file, using the **Show capture in folder** button.

5

Collecting a modem trace for Nordic Thingy:91

To collect a modem trace, you must ensure that you have the latest firmware for the board controller, update your application to enable tracing, and capture the trace while your application is running.

5.1 Preparing the board for trace collection

The Trace Collector requires a current version of the board controller firmware to be programmed on the nRF52840 SoC of the Nordic Thingy:91.

Download the latest firmware from [Nordic Thingy:91 Downloads](#) (select **Precompiled application and modem firmware**).

The archive contains images for different applications in different formats. Choose an image based on the method you use to update the firmware:

- When programming through an external debug probe, follow the steps in [Updating firmware through external debug probe](#) to program the nRF52840 SoC.
- When programming through *USB*, follow the steps in [Updating firmware through USB](#) to program the nRF52840 SoC.

5.2 Enabling tracing in the application

To capture a modem trace, you must configure your application to enable trace output over *UART*.

The following instructions assume that your application is based on the [nRF Connect SDK](#).

Note: By default, nRF Connect SDK's modem library uses the UART1 peripheral for trace output. This means that you cannot use UART1 for other purposes in your application. If this does not work for your application, you must update the configuration and code of the modem library to use a different UART peripheral for trace output.

Complete the following steps to enable tracing:

1. Set the `CONFIG_NRF_MODEM_LIB_TRACE` option in your application.
See [Configuring your application](#) for instructions on how to set this option temporarily or permanently.

Note:

- In nRF Connect SDK versions 1.5.0 - 2.0.0, the option was called `CONFIG_NRF_MODEM_LIB_TRACE_ENABLED`.
- In nRF Connect SDK v1.5.x, setting the option temporarily might cause a build error. In that case, set the option permanently in the `prj.conf` file.
- In nRF Connect SDK versions before 1.5.0, the option was called `CONFIG_BSD_LIBRARY_TRACE_ENABLED`.

2. Build your application and program it to the device.

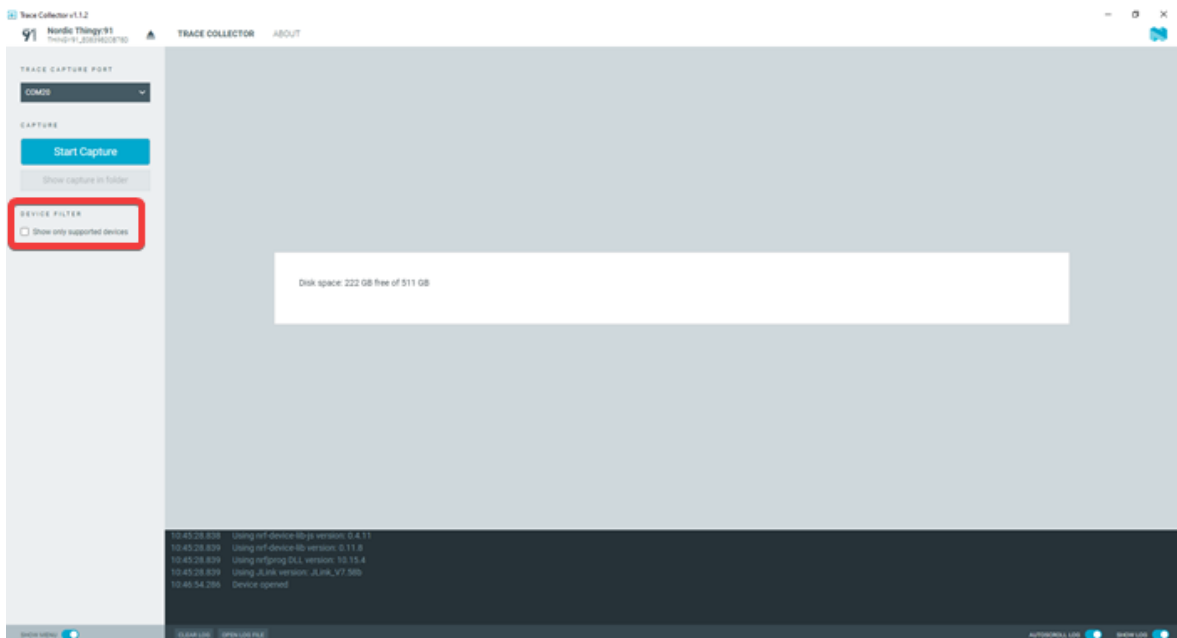
- When programming through an external debug probe, set the switch that configures which chip to program (**SW2**) to the **nRF91** position and follow the instructions in [Building and programming from the source code](#).
- When programming through *USB*, put the device into application serial recovery mode by pressing and holding the **SW3** button while powering on. Follow the instructions in [Getting started with Thingy:91](#) to program the application.

5.3 Capturing the modem trace

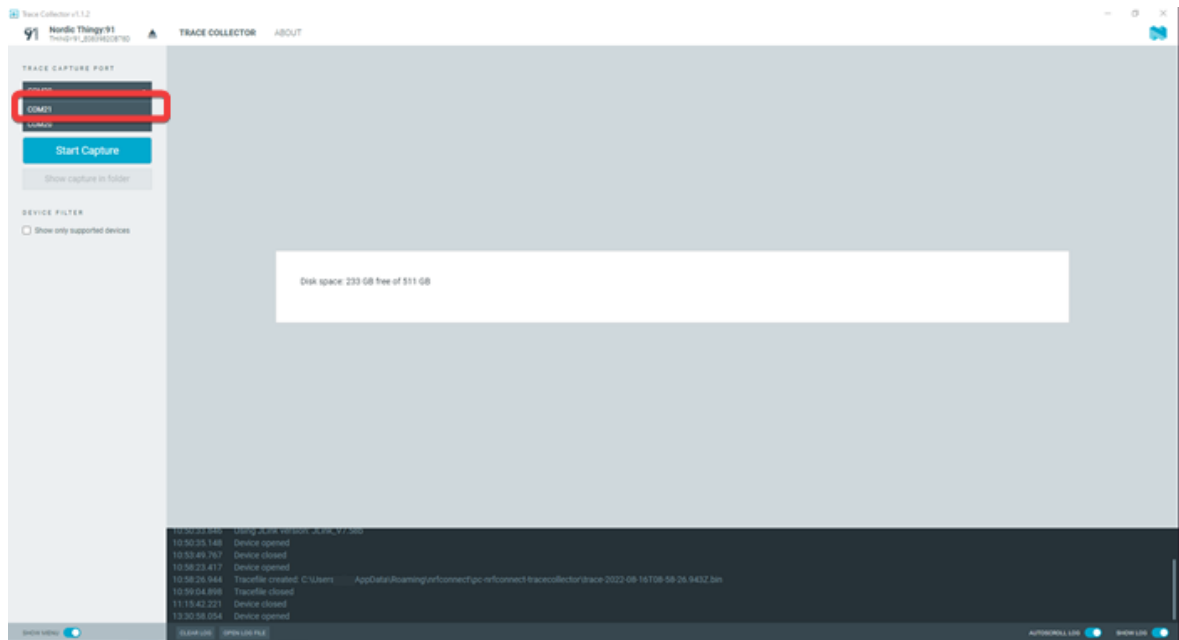
You can use Trace Collector to capture the modem trace after programming the required firmware.

Complete the following steps to start capturing:

1. Connect your device to the computer with a *USB* cable and power it on or reset it if it is already connected.
2. Check that your application is working as expected.
3. Open nRF Connect for Desktop and launch the Trace Collector app.
4. Deselect **Show only supported devices**.



5. Select your device from the drop-down list.



Set the **Trace Capture Port** to the second COM port. The first one is usually used for the application log.

6. Click the **Start Capture** button in the side panel.

You can see the status in the main view. When the modem is active, the size of the trace file should be increasing.

7. Click **Show capture in folder** to access the trace file.

By default, the trace files are stored in `C:\Users\username\AppData\Roaming\nrfconnect\pc-nrfconnect-tracecollector\`.

8. Click **Stop Capture** to stop capturing.

- You can view the current trace filename, file size and free disk space, in the Trace Collector tab.
- You can access the trace file, using the **Show capture in folder** button.

6 Collecting a modem trace for a custom board

To collect a modem trace, you must connect your board to the computer with, for example, a UART to USB device, update your application to enable tracing, and capture the trace while your application is running.

Note: You can also collect traces using the RTT interface. Enable the RTT trace backend with the `CONFIG_NRF_MODEM_LIB_TRACE_BACKEND_RTT` option and collect the traces in binary format using the j-link RTT logger. Convert the traces to PCAP with the Trace Collector V2 preview application's **Convert RAW trace to PCAP** option on the left pane. Please note that this method is still experimental and that the RTT logger output file (.log) does not show by default in the file explorer.

6.1 Preparing the board for trace collection

Trace Collector requires the board to appear as a COM port on the computer. This can be done using a *UART to USB* device.

Note: The UART to USB device must support high throughput to keep up with the modem trace output. By default, the UART trace backend in the [nRF Connect SDK](#) outputs traces with a baud rate of 1 000 000.

6.2 Enabling tracing in the application

To capture a modem trace, you must configure your application to enable trace output over *UART*.

The following instructions assume that your application is based on the [nRF Connect SDK](#).

Note: By default, nRF Connect SDK's modem library uses the UART1 peripheral for trace output. This means that you cannot use UART1 for other purposes in your application. If this does not work for your application, you must update the configuration and code of the modem library to use a different UART peripheral for trace output.

Complete the following steps to enable tracing:

1. Set the `CONFIG_NRF_MODEM_LIB_TRACE` option in your application.

See [Configuring your application](#) for instructions on how to set this option temporarily or permanently.

Note:

- In nRF Connect SDK versions 1.5.0 - 2.0.0, the option was called `CONFIG_NRF_MODEM_LIB_TRACE_ENABLED`.
- In nRF Connect SDK v1.5.x, setting the option temporarily might cause a build error. In that case, set the option permanently in the `prj.conf` file.
- In nRF Connect SDK versions before 1.5.0, the option was called `CONFIG_BSD_LIBRARY_TRACE_ENABLED`.

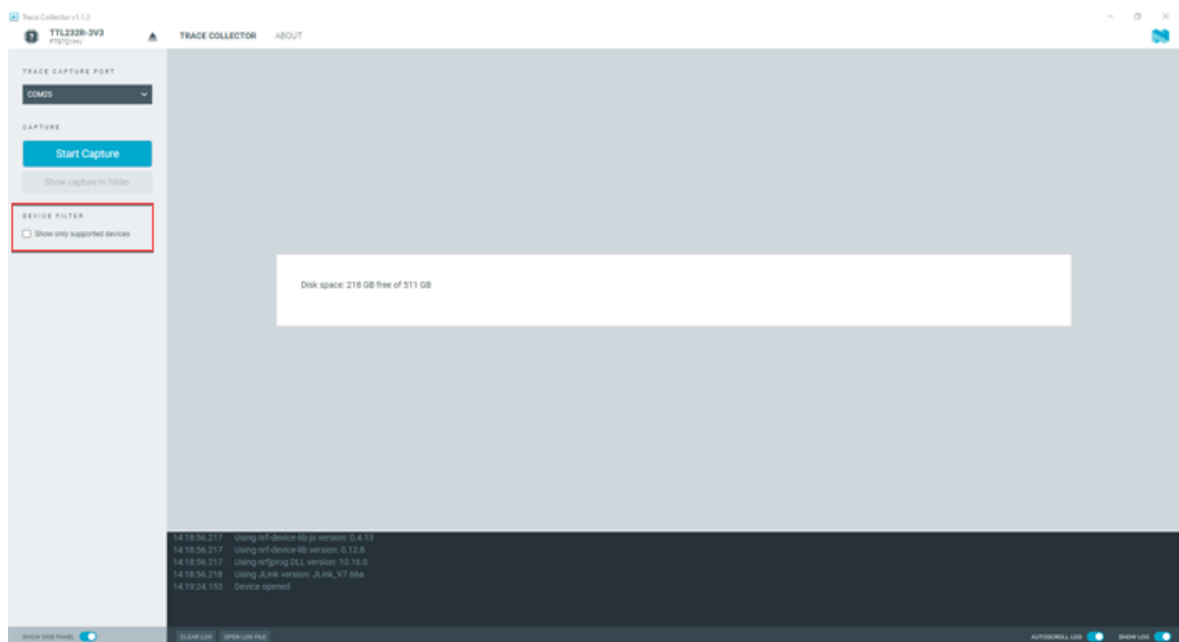
2. Configure the board's devicetree to match the hardware setup. See [trace on a custom board](#) for more details.
3. Build your application and program it to the device.

6.3 Capturing the modem trace

You can use Trace Collector to capture the modem trace.

Complete the following steps to start capturing:

1. Connect your device to the computer with the UART to serial device and power it on, or reset it if it is already connected.
2. Check that your application is working as expected.
3. Open nRF Connect for Desktop and launch the Trace Collector app.
4. Deselect **Show only supported devices**.



5. Select your device from the drop-down list.
6. Click the **Start Capture** button in the side panel.
You can see the status in the main view. When the modem is active, the size of the trace file should be increasing.
7. Click **Show capture in folder** to access the trace file.
By default, the trace files are stored in `C:\Users\username\AppData\Roaming\nrfconnect\pc-nrfconnect-tracecollector\`.
8. Click **Stop Capture** to stop capturing.
 - You can view the current trace filename, file size and free disk space, in the Trace Collector tab.
 - You can access the trace file, using the **Show capture in folder** button.

Glossary

Development Kit (DK)

A hardware development platform used for application development.

System in Package (SiP)

Several integrated circuits, often from different technologies, enclosed in a single module that performs as a system or subsystem.

System on Chip (SoC)

A microchip that integrates all the necessary electronic circuits and components of a computer or other electronic systems on a single integrated circuit.

Universal Asynchronous Receiver/Transmitter (UART)

A hardware device for asynchronous serial communication between devices.

Universal Serial Bus (USB)

An industry standard that establishes specifications for cables and connectors and protocols for connection, communication, and power supply between computers, peripheral devices, and other computers.

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