EEZ Studio User manual

Low-code embedded GUI development tool
T&M automation and management

Ver. M13 DRAFT – 03/2023
www.envox.eu
github.com/eez-open

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1.4. Contact information

If you have any problem or requirement when using EEZ products or this manual, please contact Envox:

Discord server: https://discord.gg/dhYMnCB
E-mail: support@envox.eu
Website: www.envox.eu

1.5. Revision history

Date	Version	Changes
2023-03-31	1.0	Inital version

2. The EEZ Studio overview

2.1. Introduction

EEZ Studio was initally developed as a companion application for the in-house developed H24005 programmable power supply and BB3 T&M chassis to address two important tasks: a) remote programming and management and b) simplifying the development of a feature rich embedded GUI for a color touch-screen display.

The development was inspired by the idea of offering an open source alternative to some existing commercial solutions that are used for the mentioned tasks, all in order to overcome the limitations of their closed code, outdated and complex UI or sometimes awkward UX and licensing, which in our case was not in accordance with the open source of the mentioned devices that we have developed.

2.2. Main sections

EEZ Studio consists of two main sections, which are described separately in the manual:

- **Project** – creating, editing, debugging and building the code for the embedded GUI project for the selected target platform. Generated code can be directly imported into the IDE/toolchain used to build the firmware and accelerate the development process. It enables the rapid development of high quality embedded GUI and also comes with support for the open-source LVGL graphics library. The drag-and-drop editor makes it easy to utilize the many features such as widgets, animations, and styles to create a GUI reducing the coding effort. Additionaly flowchart-like *EEZ flow* programming feature will further save development time and complexity.

- **Instrument** – allows access to one or more T&M instruments using several communication interfaces through which it is possible to manage and collect measurement data and screenshots using SCPI commands and queries. Collected data can be analyzed, searched, annotated and exported to other applications. Automation of test and measurement tasks using JavaScript and *EEZ flow* programming allows it to be used in different scenarios from basic development, calibration, troubleshooting and quality control using multiple devices from different manufacturers that can be in different locations connected to LANs.

In the introductory chapters of the two main sections that follow, all important features will be listed and described in detail.

2.3. Known issues and issue reporting

EEZ Studio is continuously developing and improving. A list of known issues can be found on GitHub where you are also invited to leave your suggestions for improvements and new functionality.

When reporting bugs using the GitHub tracking system, please first check if the issue you want to report has already been reported by someone else. When opening a new ticket, the following information can simplify and speed up the resolution:

- Descriptive/detail name of the issue (avoid general descriptions)
- Installed operating system version
- Installed EEZ Studio version
- Steps to reproduce the problem you are reporting

2.4. Donations

As an open source project, EEZ Studio has been largely developed thanks to donations primarily from NLnet foundation as well as a number of smaller individual donors. If you want to contribute to further development with your donation, you can use Liberapay.

3. Installation

3.1. System requirements

EEZ Studio is a 64-bit application. Therefore the minimum requirement for installation is a personal computer with a 64-bit operating system installed which has enough RAM and disk space for smooth operation.

Installation packages for supported operating systems for all versions of EEZ Studio are available for download at https://github.com/eez-open/studio
It is the official download page and we recommend that you get the latest version for the first installation. You will be able to check for future updates by using the option provided for that, as described below. If EEZ Studio becomes available on the websites of our partners, this information will be published on the Envox official website.

3.2. Linux

Depending on your linux distribution, choose one of the listed packages (.deb, .rpm) and start the installation using the associated installer.
In addition, there is a self-executing .AppImage version that, after downloading, needs to enable the `Allow executing file as program` option under file `Permissions` (Fig. 1) before starting it.

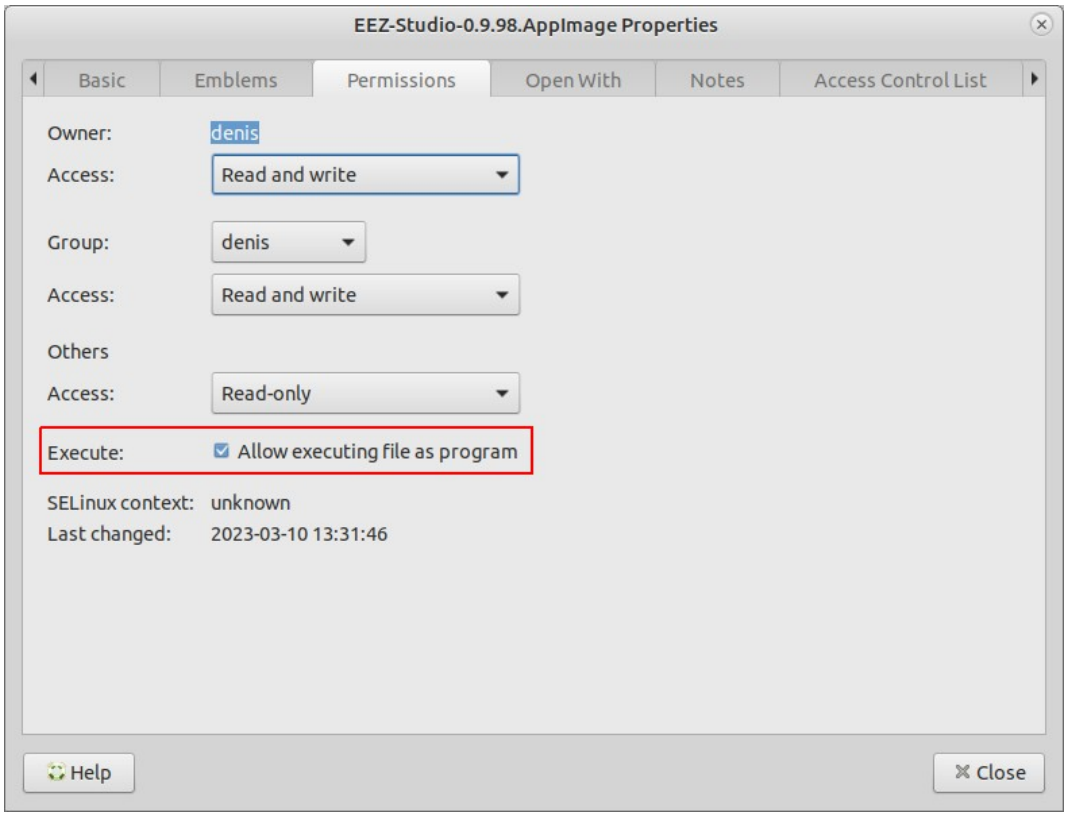

Fig. 1: .AppImage file permission

If you encounter a problem running the .AppImage version on your Linux distribution, try running it using the `--no-sandbox` option: `./EEZ-Studio-[version].AppImage --no-sandbox`

3.3. Mac

Download *eezstudio-mac.zip*, unpack and move *eezstudio.app* to Applications.

3.4. Windows

Download and start *EEZ_Studio_setup.exe*.

3.5. Nix package manager

The Nix flake provides a derivation for EEZ Studio or an overlay that provides that derivation. It can be used to install the project using Nix package manager.

3.6. Build and run from source (all operating systems)

In addition to using ready-made installation packages, it is possible to build and run EEZ Studio directly from the source code located in the GitHub repository. Below is the procedure to be followed:

- Install *Node.JS 14.x* or newer
- Install *node-gyp*, more information at https://github.com/nodejs/node-gyp#installation

3.6.1. Linux only

```
sudo apt-get install build-essential libudev-dev
```

3.6.2. Raspbian only

Install *Node.js 16* and *npm* on Raspberry Pi: https://lindevs.com/install-node-js-and-npm-on-raspberry-pi/

```
sudo apt-get install build-essential libudev-dev libopenjp2-tools ruby-full
sudo gem install fpm
```

3.6.3. All platforms

In the folder where you want to build the project, it will be necessary to clone the GitHub project repository, and start project building as follows:

```
git clone https://github.com/eez-open/studio
cd studio
npm install
npm run build
```

Start with:

```
npm start
```

Create distribution packages (except Raspbian):

```
npm run dist
```

3.6.4. On Raspbian:

```
npm run dist-raspbian
```

3.6.5. Nix

To build:

```
nix build 'github:eez-open/studio'
```

To start:

```
nix run 'github:eez-open/studio'
```

3.7. USB TMC

The USB TMC driver must be installed if you want to access the T&M instrument using the USB-TMC interface from EEZ Studio *Instrument* section.

3.7.1. Windows

Download and start Zadig. Select your device, select libusb-win32 and press “Replace Driver” button:

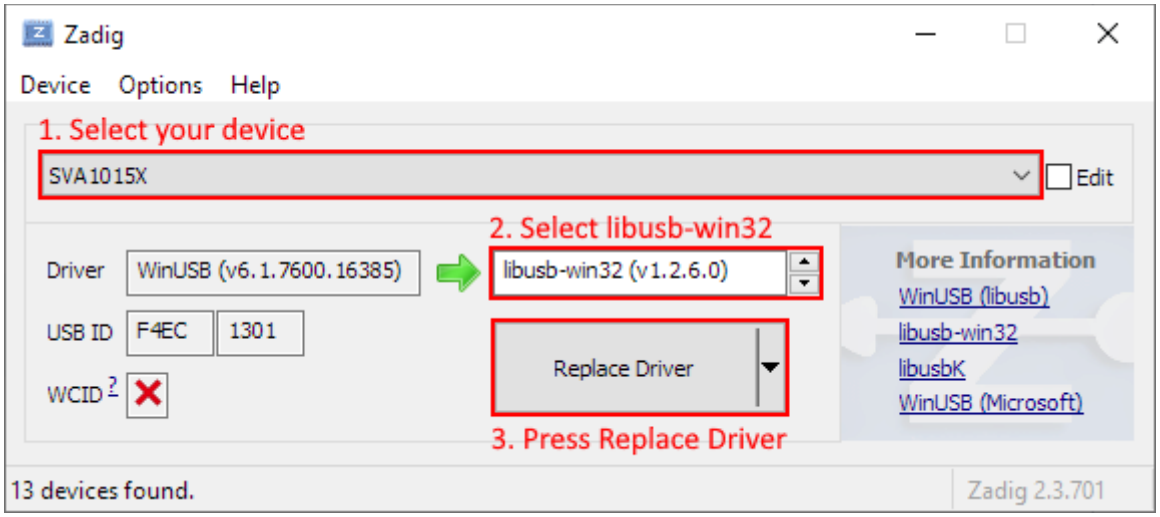

Fig. 2: Zadig driver settings

3.7.2. Linux

You will probably need to add your Linux account to the `usbtmc` group before you can access the instrument using EEZ Studio. Connect your instrument with a USB cable and turn it on. Wait until booting is complete. Now check the instrument group name by entering the following command:

```
ls -l /dev/usbtmc*
```

In case it is *root*, enter the command:

```
sudo groupadd usbtmc
```

Now, add your account (<username>) to the group:

```
sudo usermod -a -G usbtmc <username>
```

A reboot is required. After that, the *gid* of `/dev/usbtmc0` should be set to `usbtmc` and you are ready to use your instrument via USB-TMC interface.

3.8. FAQ

Q: Where is the database file by default?
A: Depending on the operating system, it can be:

- Linux: `~/.config/eezstudio/storage.db`
- Mac: `~/Library/Application\ Support/eezstudio/storage.db`
- Windows: `%appdata%\eezstudio\storage.db`

The default created database as well as its location can be changed later through the options in the *Settings* section of EEZ Studio.

Q: Where are the IEXTs (Instrument EXTensions) used to access T&M instruments stored?
A: Depending on the operating system, it can be:

- Linux: `~/.config/eezstudio/extensions`
- Mac: `~/Library/Application\ Support/eezstudio/extensions`
- Windows: `%appdata%\eezstudio\extensions`

4. Key features

4.1. General

- Modern and attractive UI/UX developed in Electron
- Light / Dark theme
- Multi-tab support for faster navigation
- Cross-platform run-time (Linux, Windows, MacOS)
- Modular design based on plug-ins that can be added/removed depends of scope of the work
- Source/Version control integration (GitHub and gitea.io)
- Open source project

4.2. EEZ Studio Project

- Modular visual development environment for designing TFT display screen decorations and defining user interaction (embedded GUI)
- LVGL (Light and Versatile Graphivs Library) support
- Generate C++ code for embedded GUI functionality that can be directly included in STM32CubeIDE for BB3 and other STM32 target platforms or Arduino IDE for H24005 and other Arduino compatible target platforms
- *Instrument definition file* (IDF) builder with context sensitive SCPI commands help (based on Keysight's Offline Command Expert command set XML structure) suitable for EEZ Studio *Instrument* and Keysight Command Expert
- SCPI command help generator based on bookmarked HTML generated directly from .odt file using EEZ WebPublish extension for OpenOffice/LibreOffice.
- Project templates (using giteo.io repositories) and comparison of projects
- Drag&drop editor for creating instrument's desktop dashboard (for remote control and management)
- Flowchart based low-code programming for desktop dashboard

4.3. EEZ Studio Instrument

- Dynamic environment where multiple instruments and other "widgets" can be configured and easily accessed
- Session oriented interaction with each SCPI instrument
- Serial (via USB), Ethernet and VISA (via free R&S®VISA) T&M instrument interfaces support
- Direct import of EEZ Studio generated IDFs and Keysight's Offline Command Expert command sets
- IEXT (Instrument EXTension) catalog with growing number of supported instruments (Rigol, Siglent, Keysight, etc.)
- History of all activities with search/content filtering
- Quick navigation via calendar ("heatmap") or sessions list view
- Shortcuts (hotkeys and buttons) that can be user defined or come predefined from imported IDF. The shortcut can contain single or sequence of SCPI commands or Javascript code.
- Javascript code for task automation (e.g. logfile, or programming list upload/download, etc.) can be also assigned to the shortcut
- SCPI commands context sensitive help with search
- File upload (instrument to PC) with image preview (e.g. screenshots)
- File download (PC to instrument) automation for transferring instrument profiles
- Simple arbitrary waveform editor (envelope and table mode)
- Displaying measurement data as graphs
- FFT analysis, harmonics and simple math functions (Period, Frequency, Min, Max, Peak-to-Peak, Average)
- Export graphs as .CSV file

5. Menu options and Settings

5.1. Home page

When EEZ Studio is started for the first time, the *Home* tab is displayed, in which the *Projects* and *Instruments* sections can be seen at the same time (Fig. 3).
The Project section will be described in detail in chapters xx to xx, and the Instrument section in chapters xx to xx.

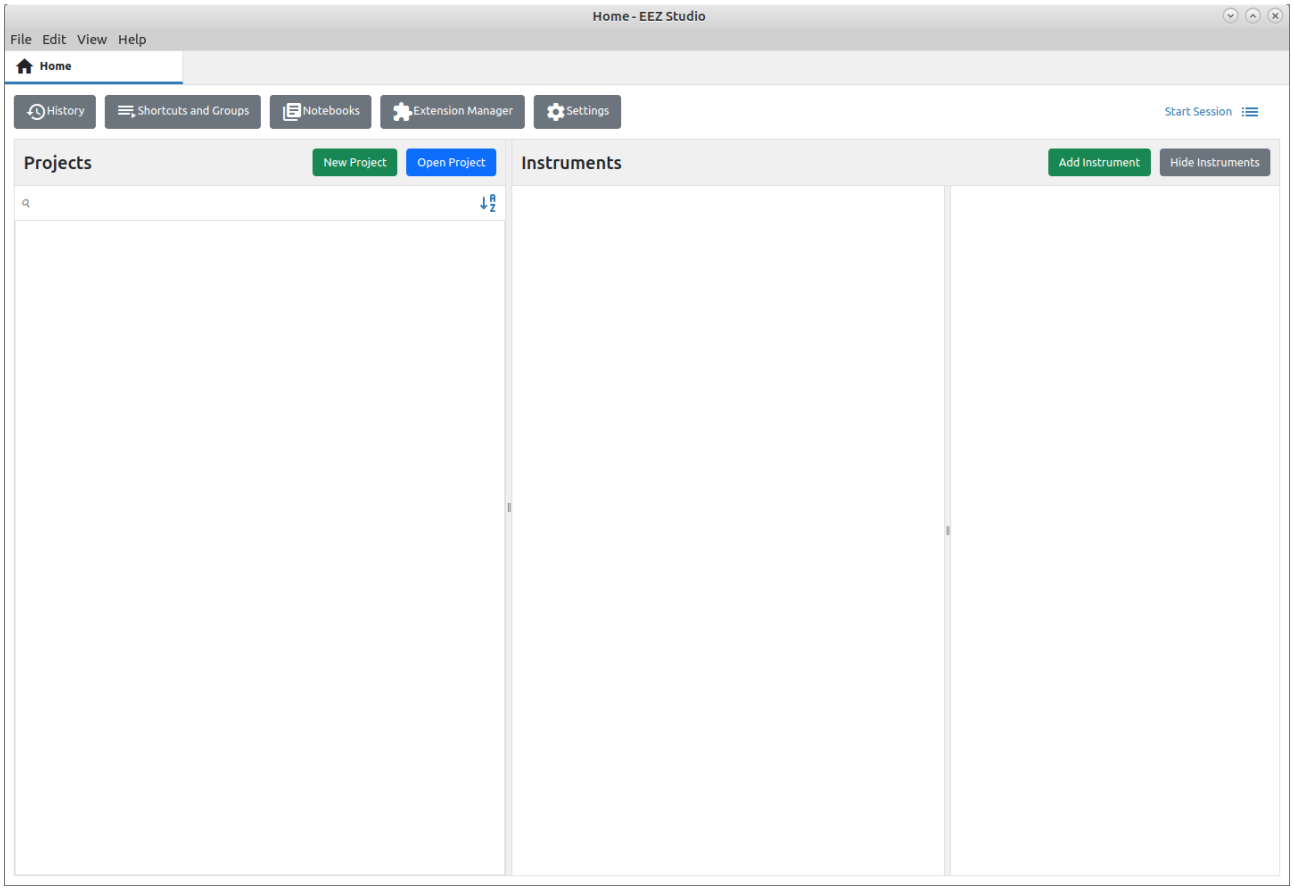

Fig. 3: Home page

5.2. Menu options

All menu options available from both sections of EEZ Studio are listed below.

5.2.1. File

Option	Shortcut	Description
New project...	Ctrl + N	Creates a new project.
Add instrument...	Alt + Ctrl + N	Adds an instrument to the EEZ Studio workbench that can be controlled.
New Window	Ctrl + Shift + N	Opens a new copy of the window.
Open...	Ctrl + O	Opens an existing project.
Open Recent		List of recently opened projects.
Import Instrument Definition...		Import IEXT (Instrument EXTension) file.
Save	Ctrl + S	Saving project files.
Exit		EEZ Studio shutdown.

5.2.2. Edit

Option	Shortcut	Description
Undo	Ctrl + Z	Undo previous action.
Redo	Ctrl + Y	Redo previous action.
Cut	Ctrl + X	Move content to Clipboard.
Copy	Ctrl + C	Copy content to Clipboard.
Paste	Ctrl + V	Paste content from Clipboard.
Delete	Del	Delete selected content.
Select All	Ctrl + A	Select all content.

5.2.3. View

Option	Shortcut	Description
Home		Return to the *Home* tab.
History		Opening the Instrument's *History* tab.
Shortcuts and Groups		Opening the Instrument's *Shortcuts and Groups* tab.
Notebooks		Opening the Instrument's *Notewbooks* tab.
Extension Manager		Opening the Instrument's *Extension Manager* tab.
Settings		Opening the *Settings* tab (Fig. 4).
Toggle Full Screen	F11	View EEZ Studio in full screen (select F11 again to restore).
Toggle Developer Tools	Ctrl + Shift + I	Opening the developer tools in the right part of the window.
Switch to Dark Theme	Ctrl + Shift + T	Toggle between Light and Dark theme.
Zoom In	Ctrl + +	Zoom in (enlargement) of all screen elements. On some Linux distributions you will need to use Ctrl + Shift + + as a shortcut.
Zoom Out	Ctrl + -	Zoom out (reduction) of all screen elements.
Reset Zoom	Ctrl + 0	Returning the zoom to the default level.
Reload		Reload all content.

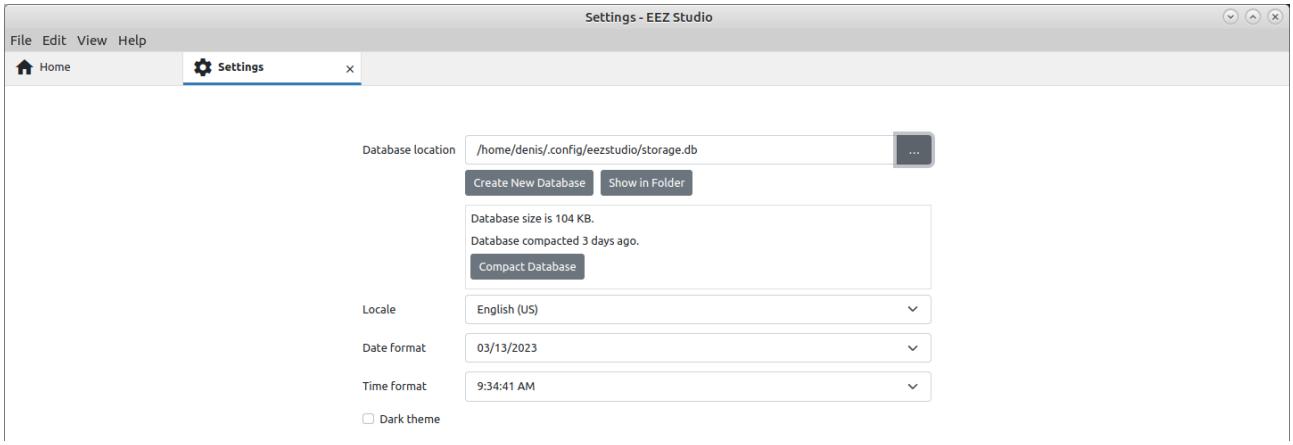

Fig. 4: Settings tab

Database location
A database is used to store the data collected in communication with the instruments. An empty base is created at first launch and its location can be seen here. You can also change the location here to one of the existing databases (backup, imported from another EEZ Studio, etc.).

Changing the parameters of the database requires a restart of EEZ Studio. The Restart *button will be displayed in the lower right corner.*

Create New Database
Creating a new database with the name and location you specified.

Show in Folder
View the folder where the database is located.

Locale
Defines the date and time formats for the selected country.

Changing the Locale requires a restart of EEZ Studio. The Restart *button will be displayed in the lower right corner.*

Date format
Display format of all date values.

Time format
Display format of all time values.

Dark theme
Toggle between Light and Dark theme (same as shortcut Ctrl + Shift + T).

5.2.4. Help

Option	Shortcut	Description
About		Opens the EEZ Studio version information (Fig. 5).

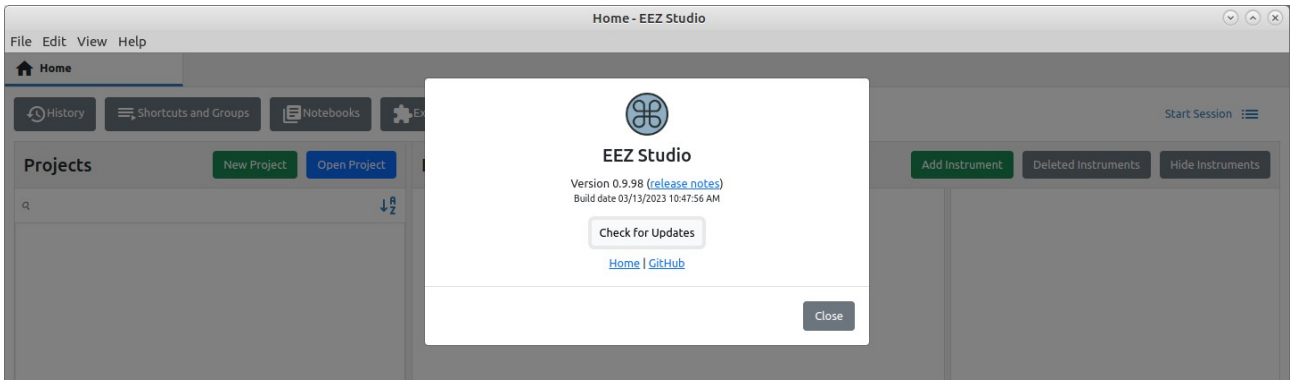

Fig. 5: About page

Check for Updates
This function requires an internet connection in order for EEZ Studio to connect to the GitHub repository and check for a newer version than the one installed.
This function does not take into account versions that have a pre-release status, but only released versions.

Home
Opens the home page of the Envox official site (requires internet browser installed).

Github
Opens Envox's GitHub home page (requires internet browser installed).

For more info visit: www.envox.eu
File repository: https://github.com/eez-open

Version: M13 DRAFT
Date: 2023-03-13