
AUTOMOTIVE
GRADE LINUX
ALL MEMBER MEETING

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MAY 13 – 14, 2026
TOKYO, JAPAN

Ultimate Unagi: Flutter App Development on Real Target Hardware

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Intro

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Topics

- AGL and Flutter
- meta-flutter
  - workspace-tool
- Setting up your dev environment
  - Basic setup
  - Setup using AGL image
  - Setup using AGL image and VScode
- Attach to hardware!
- Q/A

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AGL and Flutter

Title

- Automotive Grade Linux (AGL) transitioned to a Flutter-based UI for its Unified-Code-Base (UCB) demo.
- The UI was created by ICS and AGL within a short 3-4 month timeframe
- This talk will help you setup a powerful development environment

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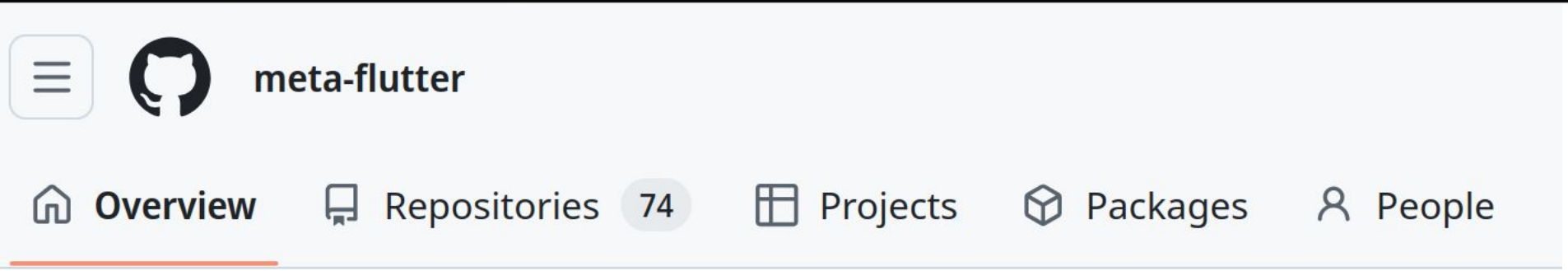
meta-flutter

meta-flutter



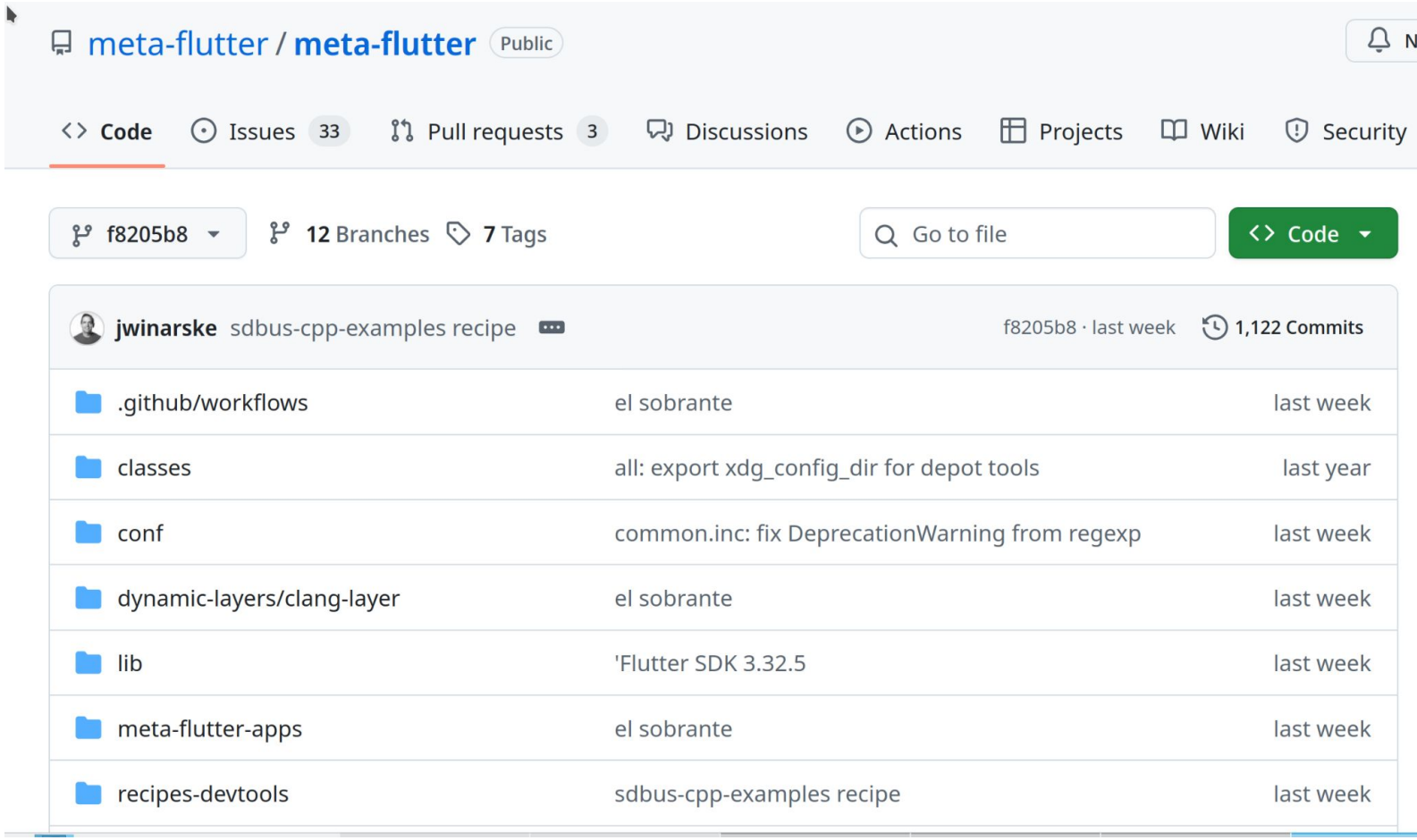
meta-flutter

- meta-flutter is the home of the 'Embedded Flutter'
- It hosts 3 main projects:
  - meta-flutter/meta-flutter - the Yocto Project layer
  - meta-flutter/workspace-automation - setup tooling
  - meta-flutter/flutter-engine - port of the flutter engine

- https://github.com/meta-flutter/

meta-flutter/meta-flutter - the YP layer

- AGL UCB is based on Yocto Project's LTS 'scarthgap'
- The 'unagi' branch of AGL uses meta-flutter 'scarthgap'
- Regular uprevs of Yocto Project and meta-flutter about every other month



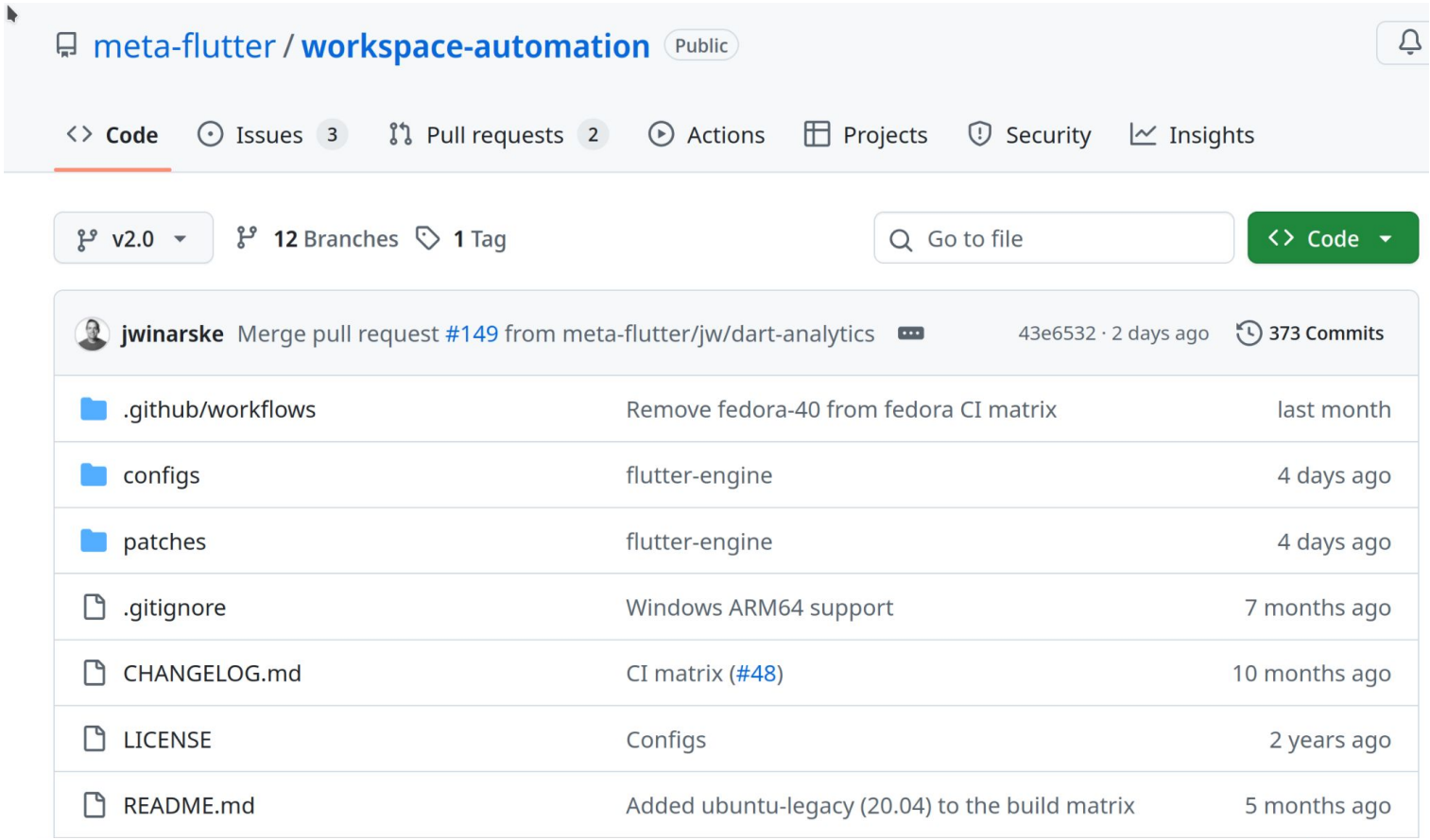
meta-flutter/workspace-automation

The workspace-automation tool was created to help setup your local development environment.

Supported systems:

- Ubuntu 22.x (x86_64)
- Fedora 37 (x86_64)
- Mac M1/M2 (arm64)

We will focus here on Ubuntu 22.x for this talk …



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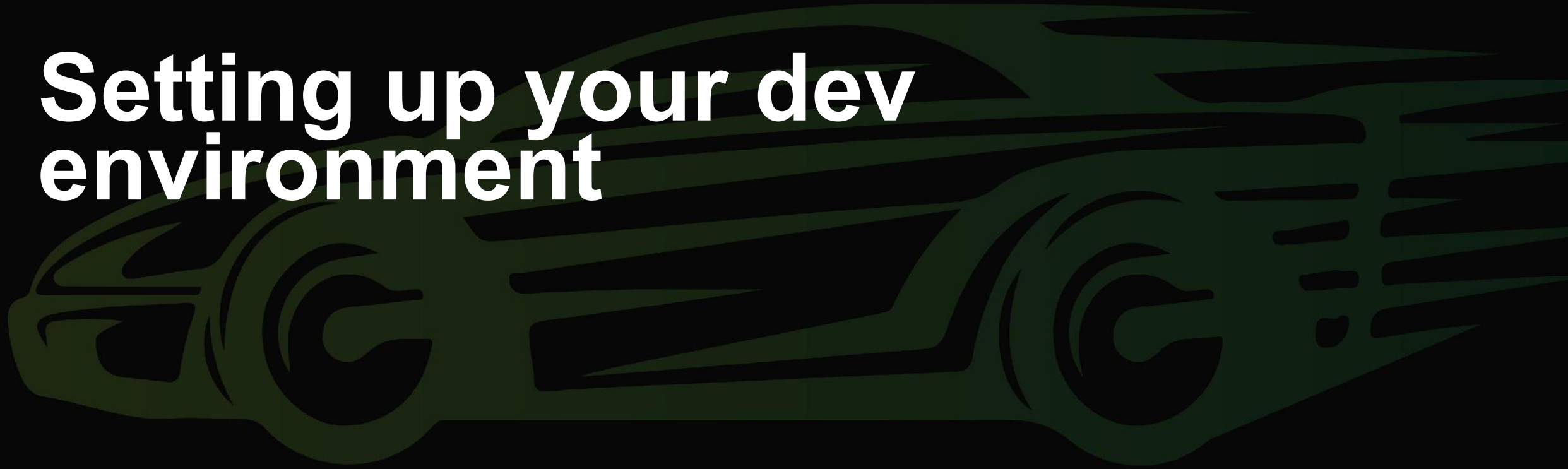
Setting up your dev environment



We will focus on a certain combination …

- meta-flutter
  - revision b6e338a8b1fc9f8907f2c9a167c972a1907ff2ea
  - SDK 3.38.3 (this needs to match with the AGL branch used)
- workspace-automation
  - revision ef660bd3c3f8da2da2139608336aa3a33f7fc2f4
- AGL (unagi branch)
  - AGL-repo revision
- If you clone AGL-repo, there will be a matching workspace-automation in ./external/workspace-automation

for reference … '--remote' feature

Use in-tree version in ./external/workspace-automation/

Call:

```
./flutter_workspace.py \
  --remote https://gerrit.automotivelinux.org/gerrit/AGL/workspace-config-agl \
  --enable agl-ivi-demo-flutter-qemu-unagi
```

… wait …

```
source setup_env.sh                          # all the magic ;)


[run-agl-ivi-demo-flutter-qemu]


cd <path_to_your_flutter_project>


flutter run [-d agl-qemu-unagi]
```

4 Example cases next

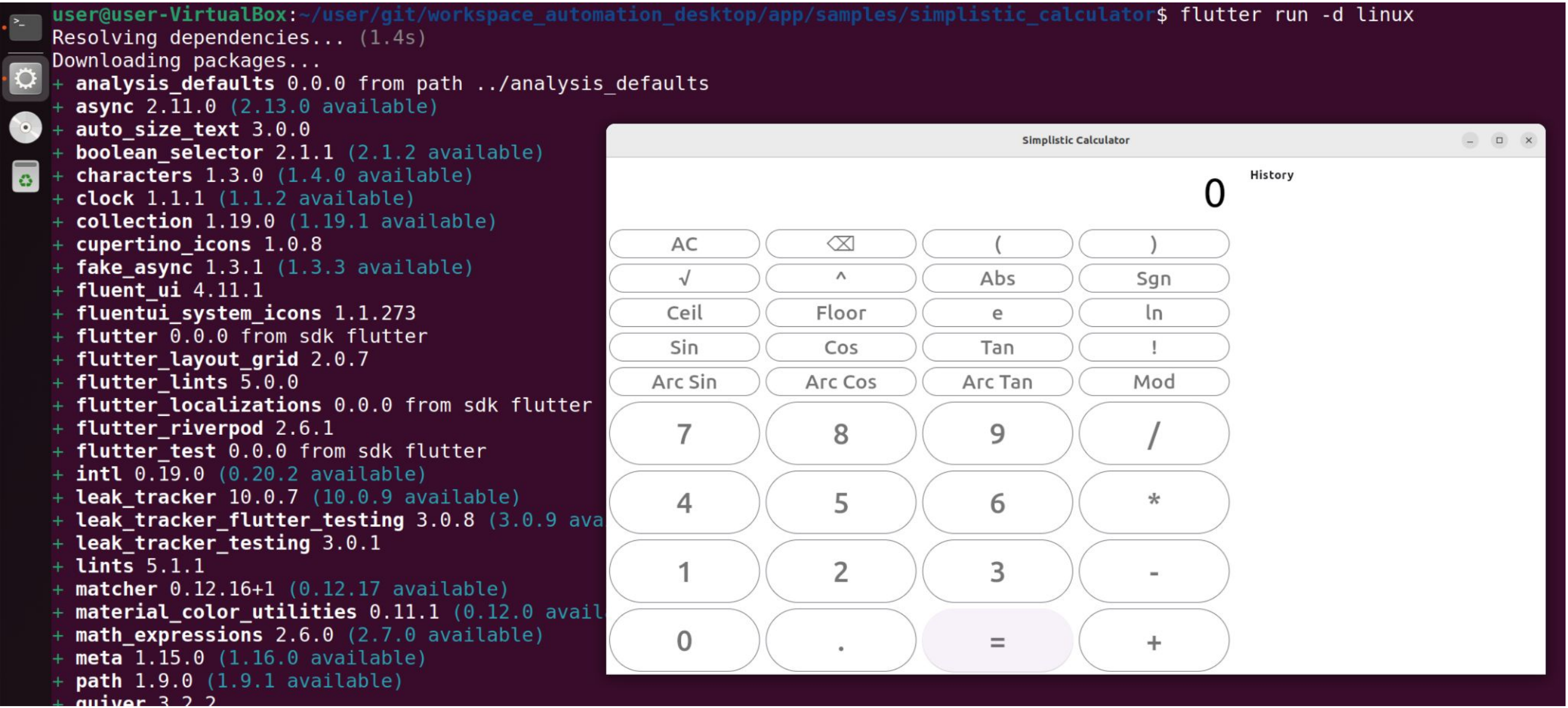
- Basic Setup (no AGL, 'Linux Desktop')
- Setup with AGL + Qemu
- AGL + QEMU + VScode
- AGL + Hardware (raspberrypi5) + VScode

Basic Setup (no AGL, 'Linux Desktop')

- Call in new terminal:
  - `source setup_env.sh`
  - `cd <path_to_your_flutter_project>`
  - `flutter run **-d linux**`

- This will compile and run your flutter application on the Linux desktop (aka Ubuntu 22.x in our case).
- You can develop, debug, run all on your PC.
- No IDE
- No specifics of the target environment!

flutter run -d linux



Pros and cons

+ simple and straightforward setup
+ native performance running the app

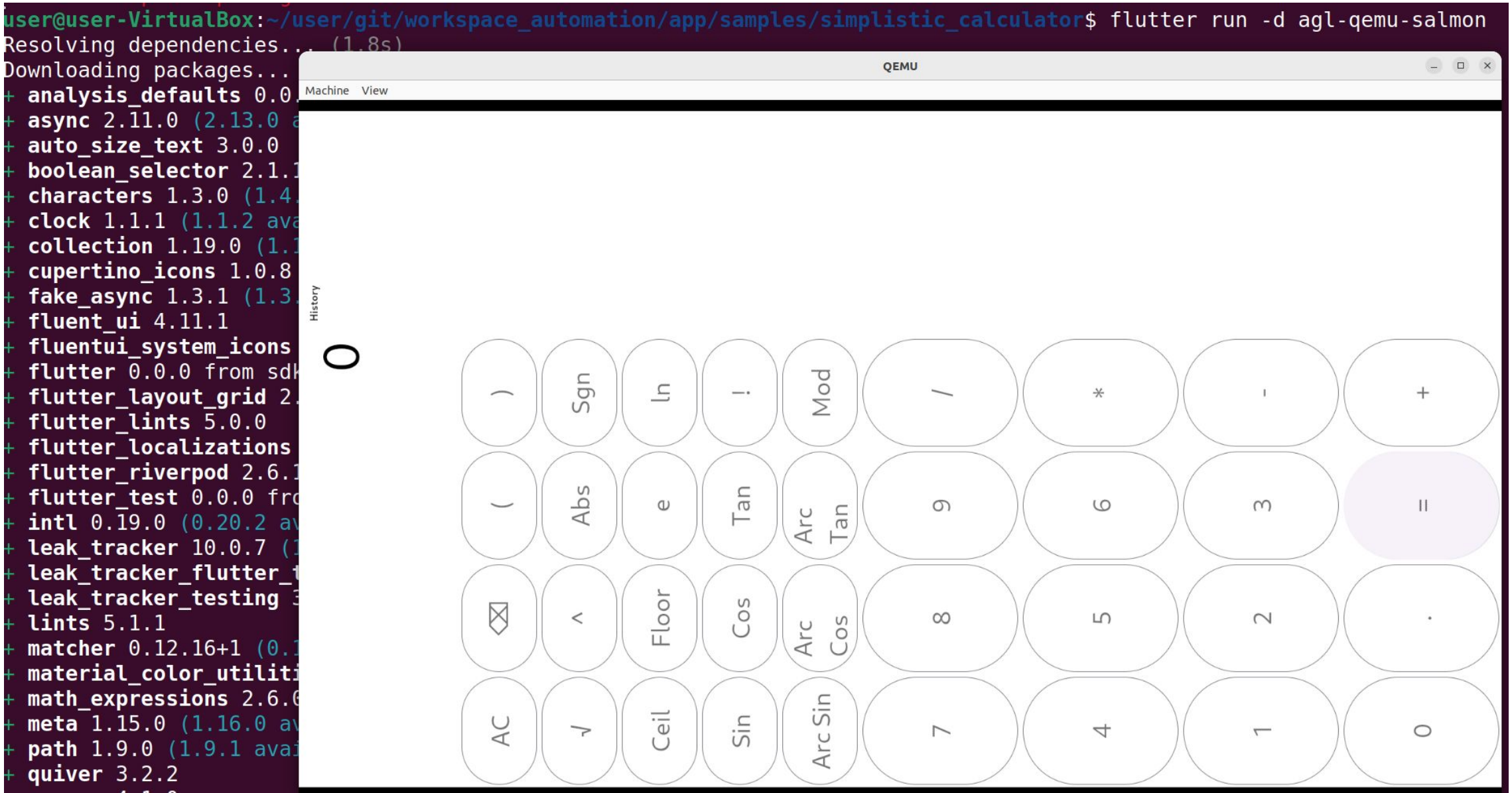
- no target environment specifics / apis available
- integration to target environment necessary later on
- no big difference to plain flutter development environment

Setup with AGL unagi + QEMU

- Call in new terminal:
  - `source setup_env.sh`
  - **`run-agl-ivi-demo-flutter-qemu-unagi`**
  - `cd <path_to_your_flutter_project>`
    - `flutter doctor -v`
      `should show: "AGL unagi-latest QEMU Image (mobile)"`
  - `flutter run` **`-d agl-qemu-unagi`**

- This will compile and run your flutter application for use within a VM that is running in the background.
- You can develop, debug, run for the target environment.
- No IDE, yet.

flutter run -d agl-qemu-unagi



Pros and cons

\+ simple and straightforward setup
\+ target environment specifics / apis
\+ no separate integration step later on needed

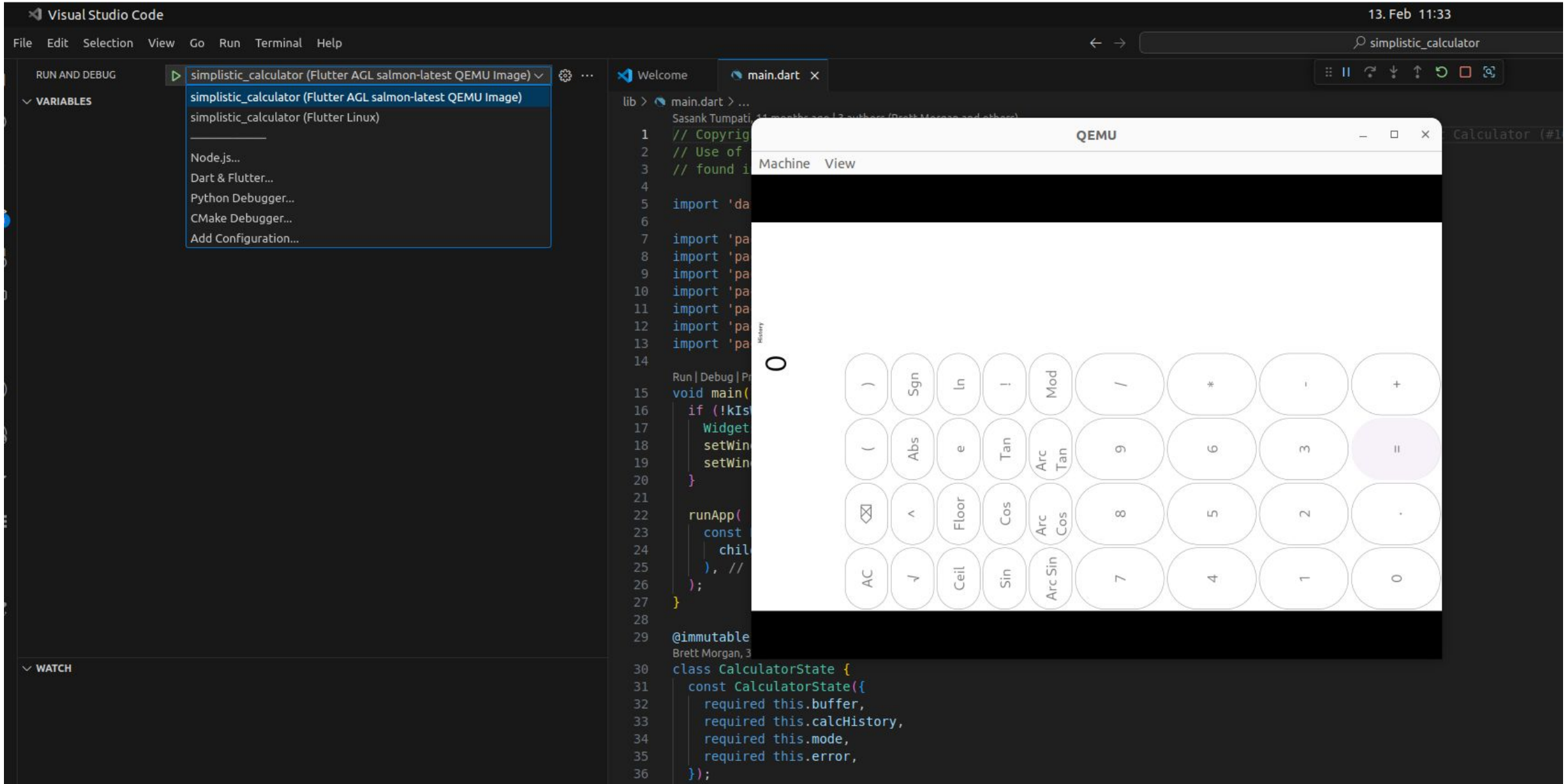
\- requires emulated target VM (qemu), thus slower

AGL unagi + QEMU + VScode

- Call in new terminal:
  - `source setup_env.sh`
  - **`run-agl-ivi-demo-flutter-qemu-unagi`**
  - `cd <path_to_your_flutter_project>`
    - `flutter doctor -v`
      `should show: "AGL unagi-latest QEMU Image (mobile)"`
  - **`code .`**
    - `select run config under flutter and choose "agl-unagi latest"`

- This will compile and run your flutter application for use within a VM that is running in the background.
- You can develop, debug, run for the target environment.
- within IDE ;)

vscode - run/debug w/ agl-qemu-unagi



Pros and cons

+ simple and straightforward setup
+ target environment specifics / apis
+ no separate integration step later on needed
+ IDE integration

- requires emulated target VM (qemu), thus a bit slower

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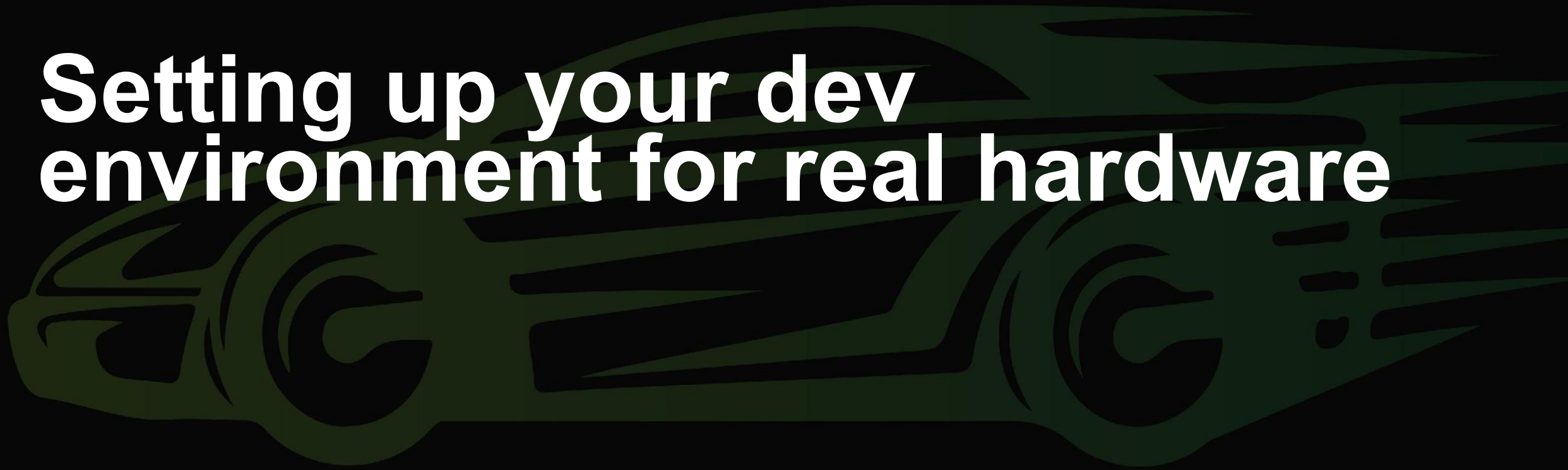


Setting up your dev environment for real hardware

Prerequisites

- **IP address**
  - The board needs to be connected to the local network and have an IP address (or at least WIFI).
- **password-less ssh**
  - need to setup **agl-driver** user for *password-less ssh access*
    - e.g. ssh root@IP && passwd -d agl-driver
    - **WARNING**: of course this is insecure !
  - or deploy ssh keys !

Adding a custom device !!

To add a custom device, there is "**`flutter custom-devices add`**" :

```
Please enter the id you want to device to have. Must contain only alphanumeric or underscore characters.
pi5-agl-unagi
Invalid input. Please enter id:
agl_pi5_unagi
Please enter the label of the device, which is a slightly more verbose name for the device.
agl-unagi-latest-pi5
SDK name and version (example: Raspberry Pi 4 Model B+)
pi5 unagi latest
Should the device be enabled? [Y/n] (empty for default)
y
Please enter the hostname or IPv4/v6 address of the device. (example: raspberrypi)
192.168.2.165
Please enter the username used for ssh-ing to the remote device.
agl-driver
Please enter the command executed on the remote device for starting the app. "/tmp/${appName}" is the
path to the asset bundle. (example: flutter-pi /tmp/${appName})
flutter-auto -b /tmp/${appName}
Should the device use port forwarding? Using port forwarding is the default because it works in all
cases, however if your remote device has a static IP address and you have a way of specifying the
"--vm-service-host=<ip>" engine option, you might prefer not using port forwarding. [Y/n]
n
Enter the command executed on the remote device for taking a screenshot. (example: fbgrab
/tmp/screenshot.png && cat /tmp/screenshot.png | base64 | tr -d ' \n\t', empty for no screenshotting
support)

Would you like to add the custom device to the config now? [Y/n] (empty for default)
y
```

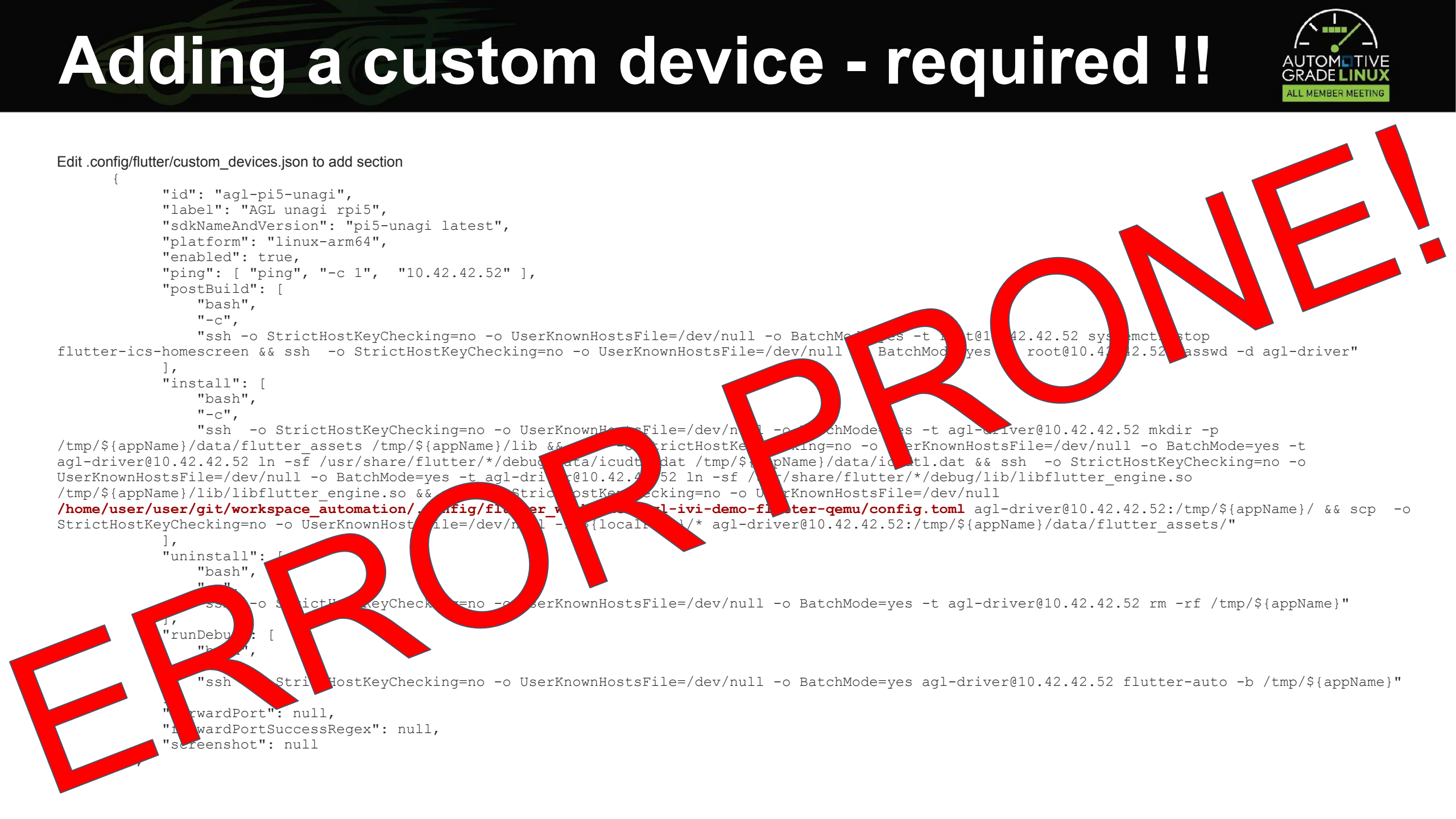
NOT ENOUGH

Manual edits … :(

The automated configuration is not perfect, yet.

We need to edit .config/flutter/custom_devices.json manually …

Adding a custom device - required !!



Edit .config/flutter/custom_devices.json to add section

```
      {
            "id": "agl-pi5-unagi",
            "label": "AGL unagi rpi5",
            "sdkNameAndVersion": "pi5-unagi latest",
            "platform": "linux-arm64",
            "enabled": true,
            "ping": [ "ping", "-c 1",  "10.42.42.52" ],
            "postBuild": [
                "bash",
                "-c",
                "ssh -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes -t root@10.42.42.52 systemctl stop
flutter-ics-homescreen && ssh  -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes -t root@10.42.42.52 passwd -d agl-driver"
            ],
            "install": [
                "bash",
                "-c",
                "ssh  -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes -t agl-driver@10.42.42.52 mkdir -p
/tmp/${appName}/data/flutter_assets /tmp/${appName}/lib && scp -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes -t
agl-driver@10.42.42.52 ln -sf /usr/share/flutter/*/debug/data/icudtl.dat /tmp/${appName}/data/icudtl.dat && ssh  -o StrictHostKeyChecking=no -o
UserKnownHostsFile=/dev/null -o BatchMode=yes -t agl-driver@10.42.42.52 ln -sf /usr/share/flutter/*/debug/lib/libflutter_engine.so
/tmp/${appName}/lib/libflutter_engine.so && scp -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null
/home/user/user/git/workspace_automation/.config/flutter_workspace/agl-ivi-demo-flutter-qemu/config.toml agl-driver@10.42.42.52:/tmp/${appName}/ && scp  -o
StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -r ${localAssetDirectory}/* agl-driver@10.42.42.52:/tmp/${appName}/data/flutter_assets/"
            ],
            "uninstall": [
                "bash",
                "-c",
                "ssh -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes -t agl-driver@10.42.42.52 rm -rf /tmp/${appName}"
            ],
            "runDebug": [
                "bash",
                "-c",
                "ssh -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes agl-driver@10.42.42.52 flutter-auto -b /tmp/${appName}"
            ],
            "forwardPort": null,
            "forwardPortSuccessRegex": null,
            "screenshot": null
```

ERROR PRONE!

Use workspace_automation template

Instead:

```
./flutter_workspace.py \
  --remote https://gerrit.automotivelinux.org/gerrit/AGL/workspace-config-agl \
  --enable agl-ivi-demo-flutter-pi5-unagi
```

- source setup_env.sh
- cd <path_to_your_flutter_project>
  - flutter doctor -v
    should show: "AGL unagi-latest pi5 (mobile)"

```
[✓] Connected device (3 available) [64ms]
    • Linux (desktop)                • linux            • linux-x64   • Ubuntu 22.04.5 LTS 6.8.0-111-generic
    • Toyota homescreen (mobile)     • desktop-homescreen • linux-x64 • homescreen x86_64
    • AGL unagi-latest pi5 (mobile)  • agl-pi5-unagi    • linux-arm64 • pi5-unagi latest
```

- flutter run **-d agl-pi5-unagi**

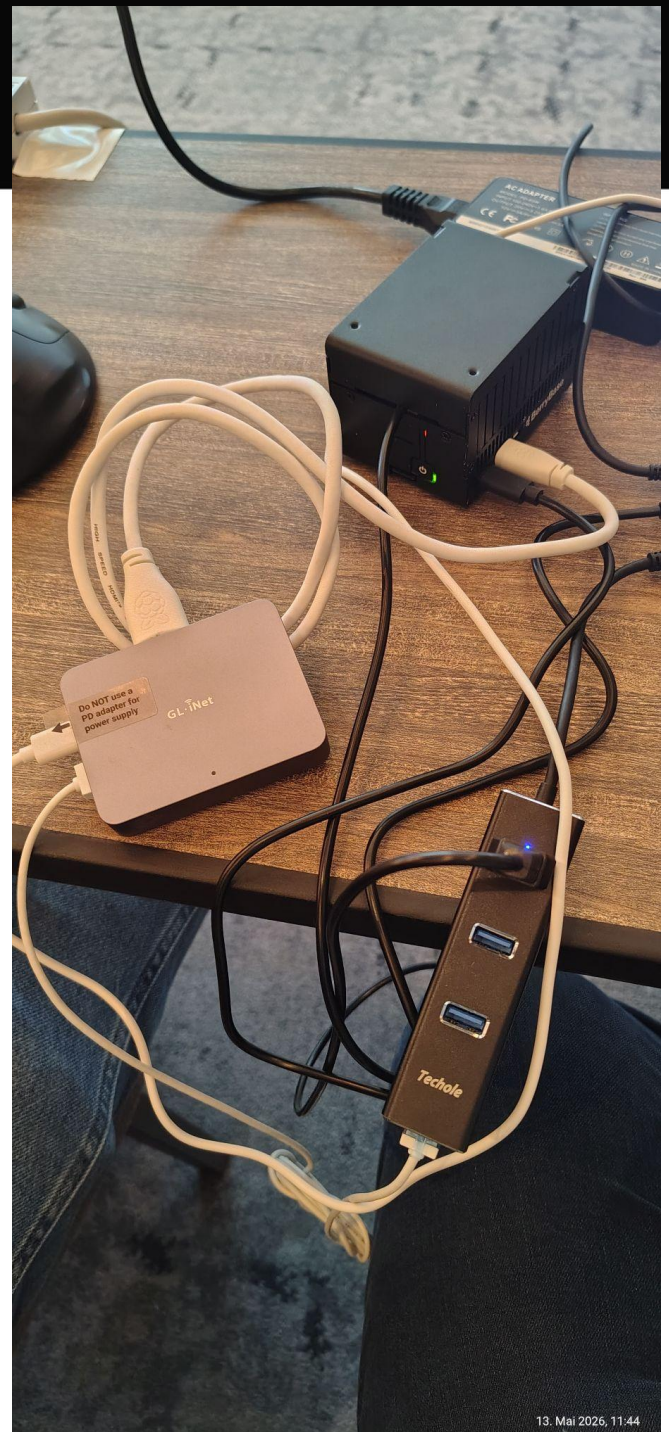
Template:


```
{
  "id": "agl-ivi-demo-flutter-pi5-unagi",
  "flutter_version": "3.38.3",
  "load": false,
  "supported_archs": [
    "aarch64",
    "arm64",
    "x86_64"
  ],
  "supported_host_types": [
    "darwin",
    "fedora",
    "ubuntu"
  ],
  "type": "remote",
  "env": {
    "DEVICE_HOSTNAME": "raspberrypi5.local",
    "COMPOSITOR_USER": "agl-driver",
    "SERVICE_NAME": "flutter-ics-homescreen",
    "SCP_PREFIX": "scp -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null",
    "SSH_PREFIX": "ssh -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -o BatchMode=yes",
    "PING_CMD": "ping -c 1 -w 400 ${DEVICE_HOSTNAME}",
    "STOP_SERVICE": "${SSH_PREFIX} -t root@${DEVICE_HOSTNAME} systemctl stop ${SERVICE_NAME}",
    "FLUTTER_AUTO_EXE": "flutter-auto -b /tmp/${appName}",
    "FLUTTER_DEBUG_PORT": "1234",
    "FLUTTER_OBSERVATORY_HOST": "raspberrypi5.local",
    "RELEASE_NAME": "unagi",
    "RELEASE_VERSION": "latest",
    "DELETE_USER_PWD": "${SSH_PREFIX} -t root@${DEVICE_HOSTNAME} passwd -d ${COMPOSITOR_USER}",
    "DELETE_APP_FOLDER": "${SSH_PREFIX} -t ${COMPOSITOR_USER}@${DEVICE_HOSTNAME} rm -rf /tmp/${appName}",
    "CREATE_BUNDLE_FOLDERS": "${SSH_PREFIX} -t ${COMPOSITOR_USER}@${DEVICE_HOSTNAME} mkdir -p /tmp/${appName}/data/flutter_assets /tmp/${appName}/lib",
    "CREATE_BUNDLE_ICUDTL_SYMLINK": "${SSH_PREFIX} -t ${COMPOSITOR_USER}@${DEVICE_HOSTNAME} ln -sf /usr/share/flutter/*/debug/data/icudtl.dat
/tmp/${appName}/data/icudtl.dat",
    "CREATE_BUNDLE_ENGINE_SYMLINK": "${SSH_PREFIX} -t ${COMPOSITOR_USER}@${DEVICE_HOSTNAME} ln -sf /usr/share/flutter/*/debug/lib/libflutter_engine.so
/tmp/${appName}/lib/libflutter_engine.so",
    "CREATE_BUNDLE_FOLDER": "${CREATE_BUNDLE_FOLDERS} && ${CREATE_BUNDLE_ICUDTL_SYMLINK} && ${CREATE_BUNDLE_ENGINE_SYMLINK}",
    "COPY_PLATFORM_ID_CONFIG_TO_DEVICE": "${SCP_PREFIX} ${PLATFORM_ID_DIR}/config.toml ${COMPOSITOR_USER}@${DEVICE_HOSTNAME}:/tmp/${appName}/",
    "COPY_ASSETS_TO_DEVICE": "${SCP_PREFIX} -r ${localPath}/* ${COMPOSITOR_USER}@${DEVICE_HOSTNAME}:/tmp/${appName}/data/flutter_assets/"
  },
  "runtime": {
    "config": {
      "global": {
        "cursor_theme": "DMZ-White",
        "app_id": "agl-pi5-unagi"
      },
      "view": {
        "window_type": "BG",
        "width": 1080,
        "height": 1920,
        "fullscreen": true
      },
      "window_activation_area": {
        "x": 0,
        "y": 0,
        "width": 1080,
        "height": 1920
      }
    },
    "pre-requisites": {
      "arm64": {
        "darwin": {
          "cmds": [
            "bash -c \"arch -arm64 brew install xz qemu\""
          ]
        }
      },
      "x86_64": {
        "darwin": {
          "cmds": [
            "bash -c \"arch -arm64 brew install xz qemu\""
          ]
        }
      }
    }
  },
  "overwrite-existing": true,
  "custom-device": {
    "id": "agl-pi5-${RELEASE_NAME}",
    "label": "AGL ${RELEASE_NAME}-${RELEASE_VERSION} pi5",
    "sdkNameAndVersion": "pi5-${RELEASE_NAME} ${RELEASE_VERSION}",
    "platform": "linux-arm64",
    "enabled": true,
    "ping": "bash -c \"${PING_CMD}\"",
    "pingSuccessRegex": "1 received",
    "postBuild": "bash -c \"${STOP_SERVICE} && ${DELETE_USER_PWD}\"",
    "install": "bash -c \"${CREATE_BUNDLE_FOLDER} && ${COPY_PLATFORM_ID_CONFIG_TO_DEVICE}
&& ${COPY_ASSETS_TO_DEVICE}\"",
    "uninstall": "bash -c \"${DELETE_APP_FOLDER}\"",
    "runDebug": "bash -c \"${SSH_PREFIX} ${COMPOSITOR_USER}@${DEVICE_HOSTNAME}
${FLUTTER_AUTO_EXE}\"",
    "forwardPort": null,
    "forwardPortSuccessRegex": null,
    "screenshot": null
  }
}
```

Executing on the target …

PI5 , USB gadget enabled for cdc-network

HDMI KVM device for capturing output + mouse input



Executing on the target …

DEMO:

```
cd flutter/examples/image_list/
flutter run -d agl-pi5-unagi
```

Summary

To enable a local hardware device with the meta-flutter workspace_automation,
we need to create/use a template file!

It contains the necessary abstractions to enable running your application on the device.

We do either hardcode an IP address or a hostname.

Todo: enable debug port connection

PATCHES FOR MORE DEVICES TEMPLATES WELCOME !!

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