Zephyr & Visual Studio Code:

How to Develop Zephyr Apps with a Modern, Visual IDE

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Today's Talk

- Why Visual Studio Code (VS Code) is so popular
- Current state of VS Code for embedded development
- Digging into VS Code
- Live demo
- Future topics to explore

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Founder & CEO at Golioth

- Career building developer platforms
- Decade in IoT; Nest, Particle, WeWork
- Working with Zephyr since 2016

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What is Golioth?

- Golioth is an IoT cloud company.
- We make it easy for hardware engineers to connect their sensors and devices to the web without needing to be a cloud expert.
- We use Zephyr to support the widest range of hardware possible.
- We build reference designs with Zephyr and regularly build things using the ecosystem.

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VS Code is Popular

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Quick poll: VS Code users in the room

- Who has tried VS Code?

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Quick poll: VS Code users in the room

- Who has tried VS Code?
- Who uses VS Code today for non-embedded? Ex. Web, Python, etc?

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Quick poll: VS Code users in the room

- Who has tried VS Code?
- Who uses VS Code today for non-embedded? Ex. Web, Python, etc?
- Who has tried to use VS Code for embedded?

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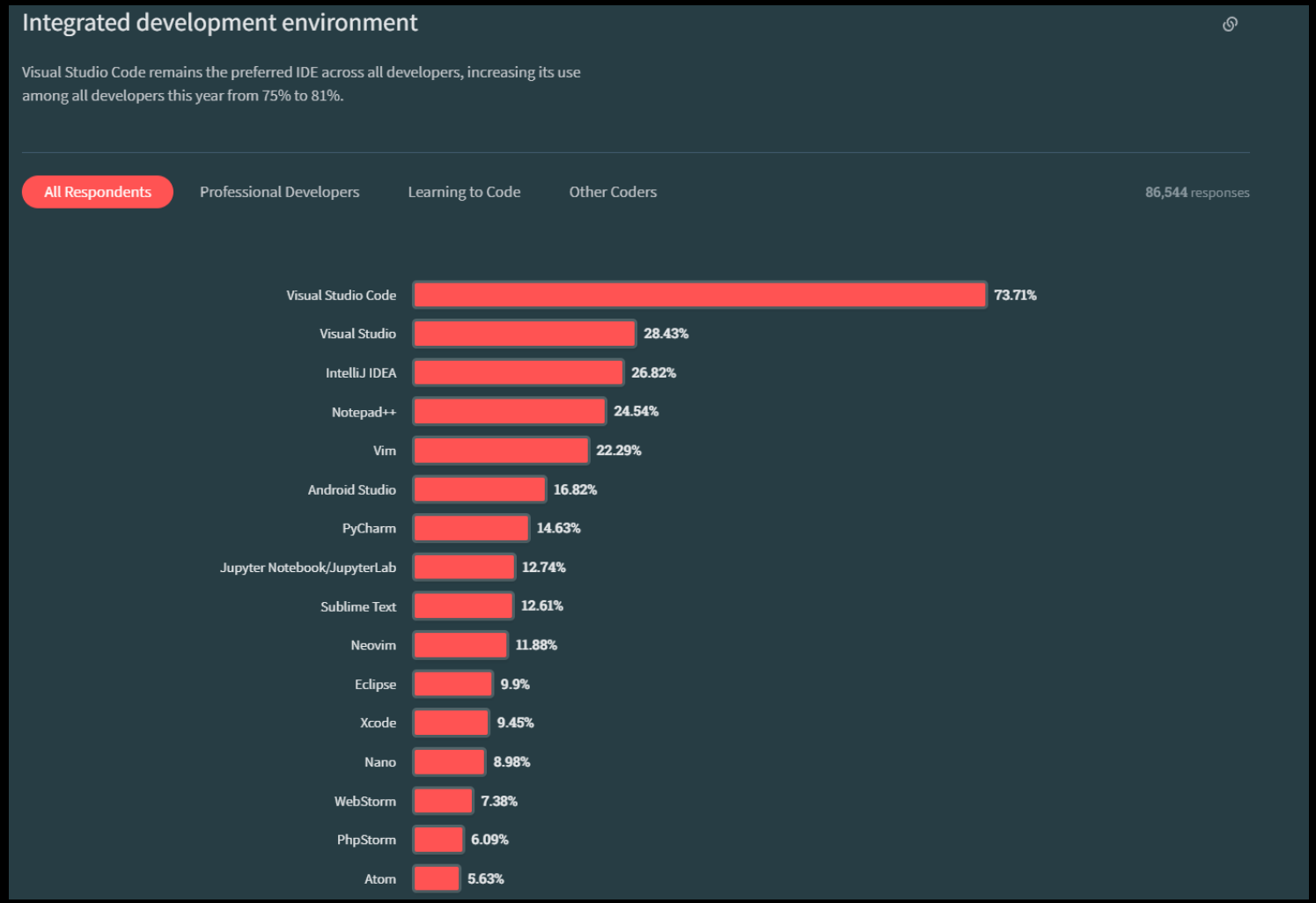
Globally ranked #1 "IDE" among devs



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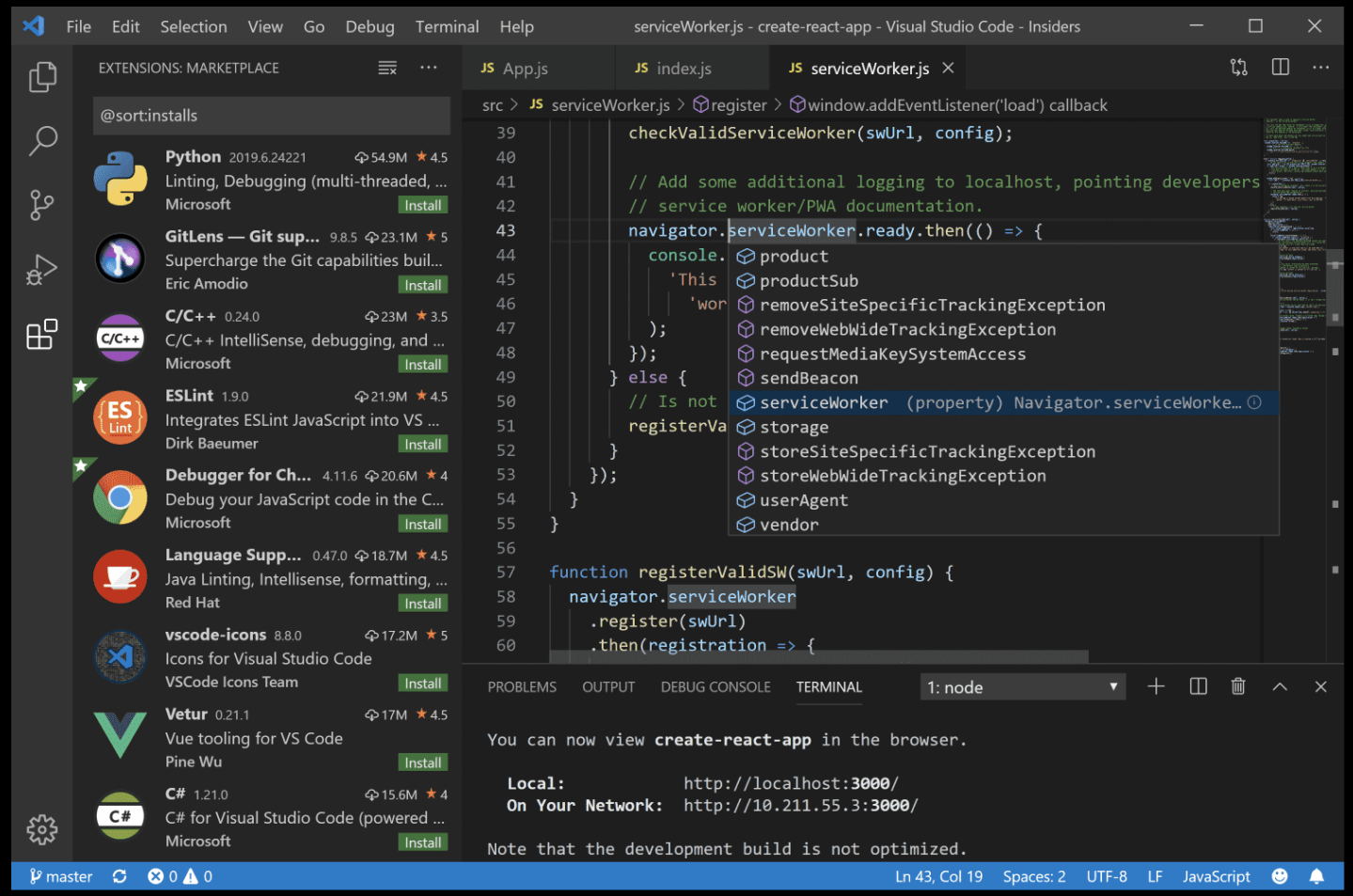
Why is it so popular?

- Free
- Fast
- Cross platform
- Highly customizable
- Highly configurable
- IDE feels



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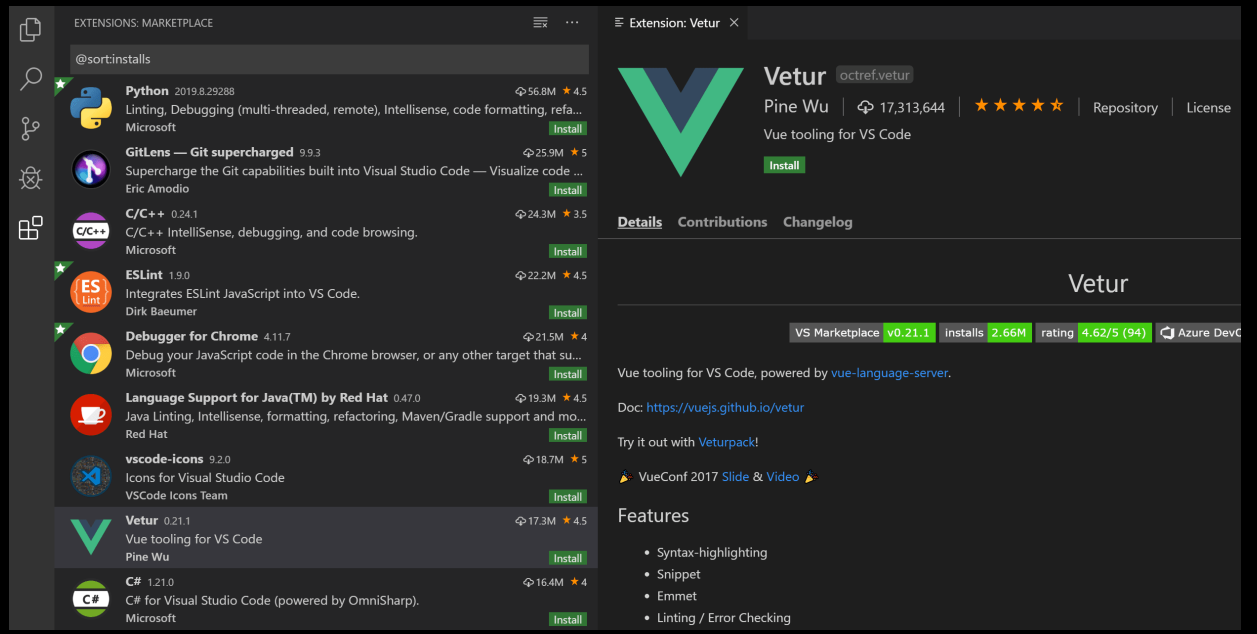
Customizable

- Extensions for most things
  - Programming Langs
  - Themes
  - Debuggers
  - Keymaps
  - Formatters
  - Linters
  - ...much more (180k+)



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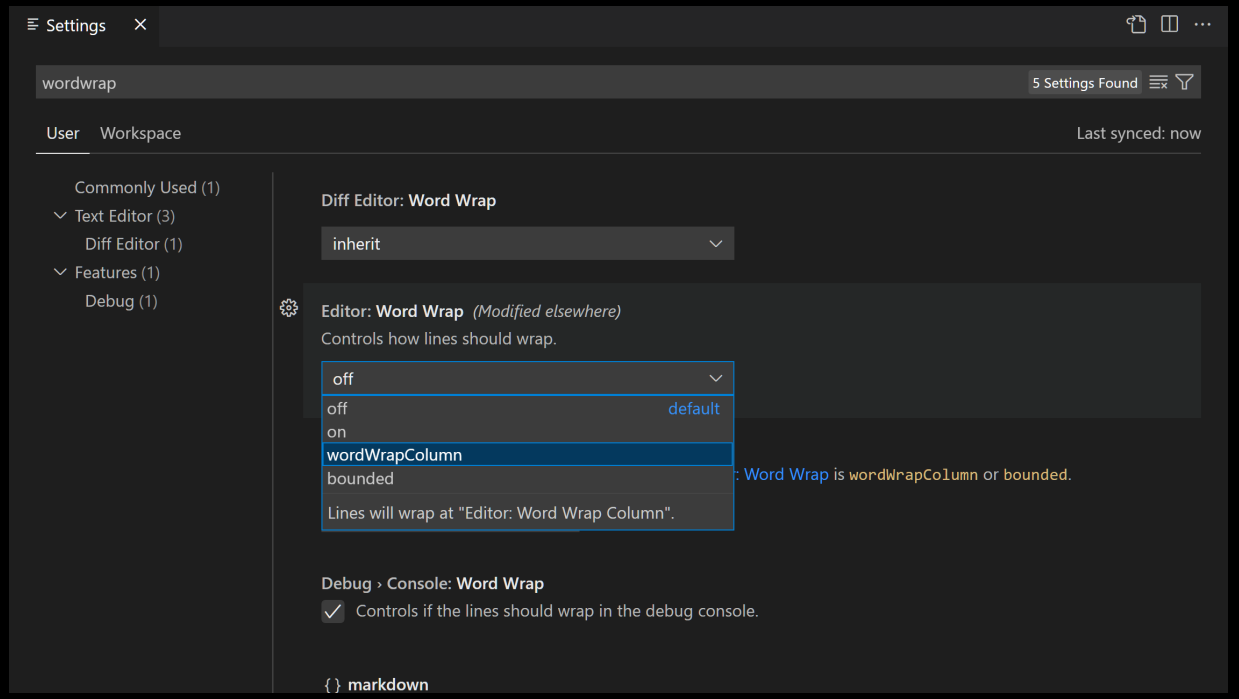
Configurable

- GUI or JSON
- Settings for everything:
  - Appearance
  - Behavior
  - Extensions
- Global or per project



Understanding settings is key to unlocking all the benefits of VS Code!

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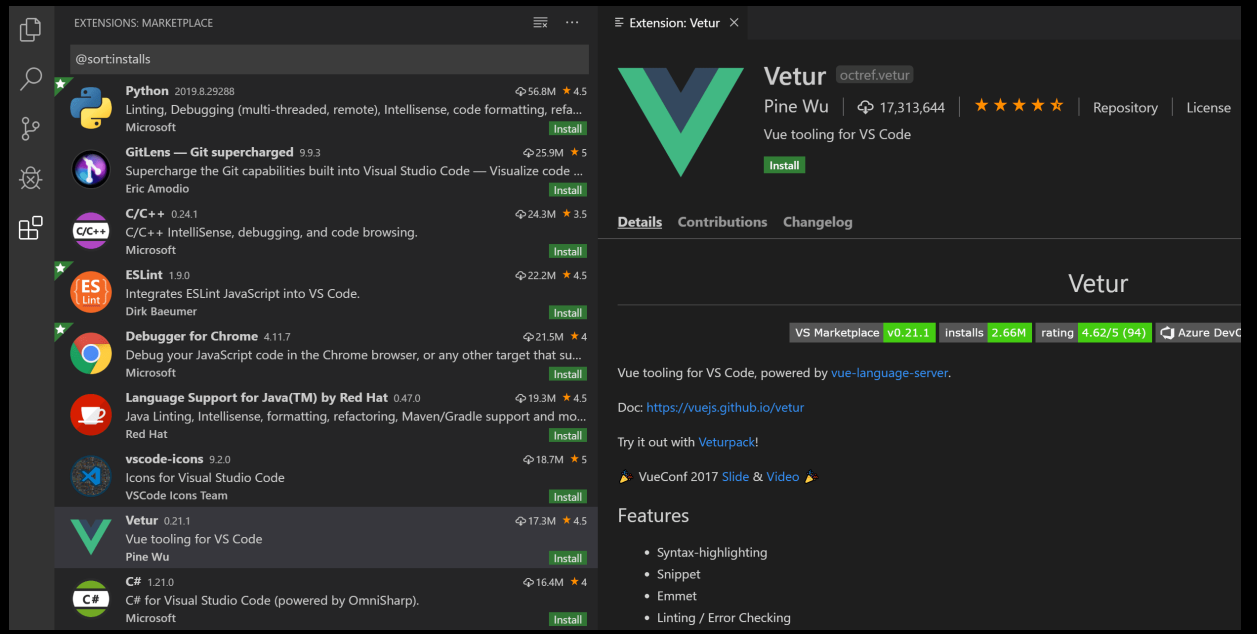
IDE-like features

- IntelliSense
- Code Navigation
- Refactoring
- Debugging
- Tasks
- Source Control
- Terminal
- Snippets



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VS Code for Embedded

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Vendor adoption

?

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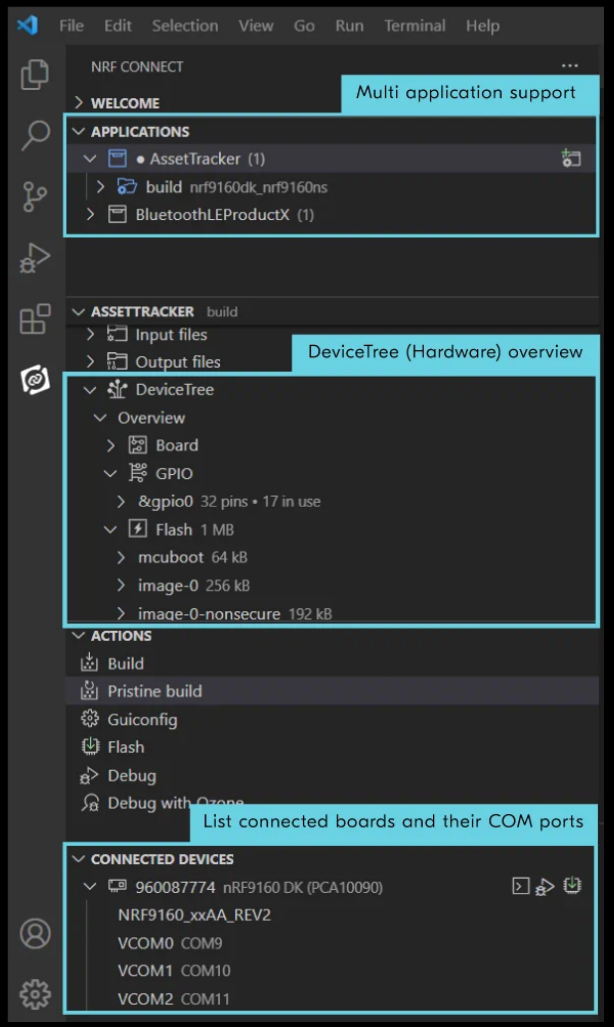
Targetting Zephyr

- ~~Platformio~~
- nRF Connect from Nordic
- Circuit Dojo
  - Check out Jared's talk after this!
- Coming soon: MCUXpresso from NXP
- DIY

DIY is the focus of this talk



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Digging into VS Code

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Ideal embedded workflow in VS Code

- "Smart coding"
- Build, Flash, Test & Debug easily
- Reproducible environments

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Rest of this talk

- Extensions for embedded
- Configuring VS Code
- Live demo
- Future topics

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Extensions for Embedded

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Types of extensions

- General coding
- Embedded (like Debugging)
- Microsoft vs community vs vendor

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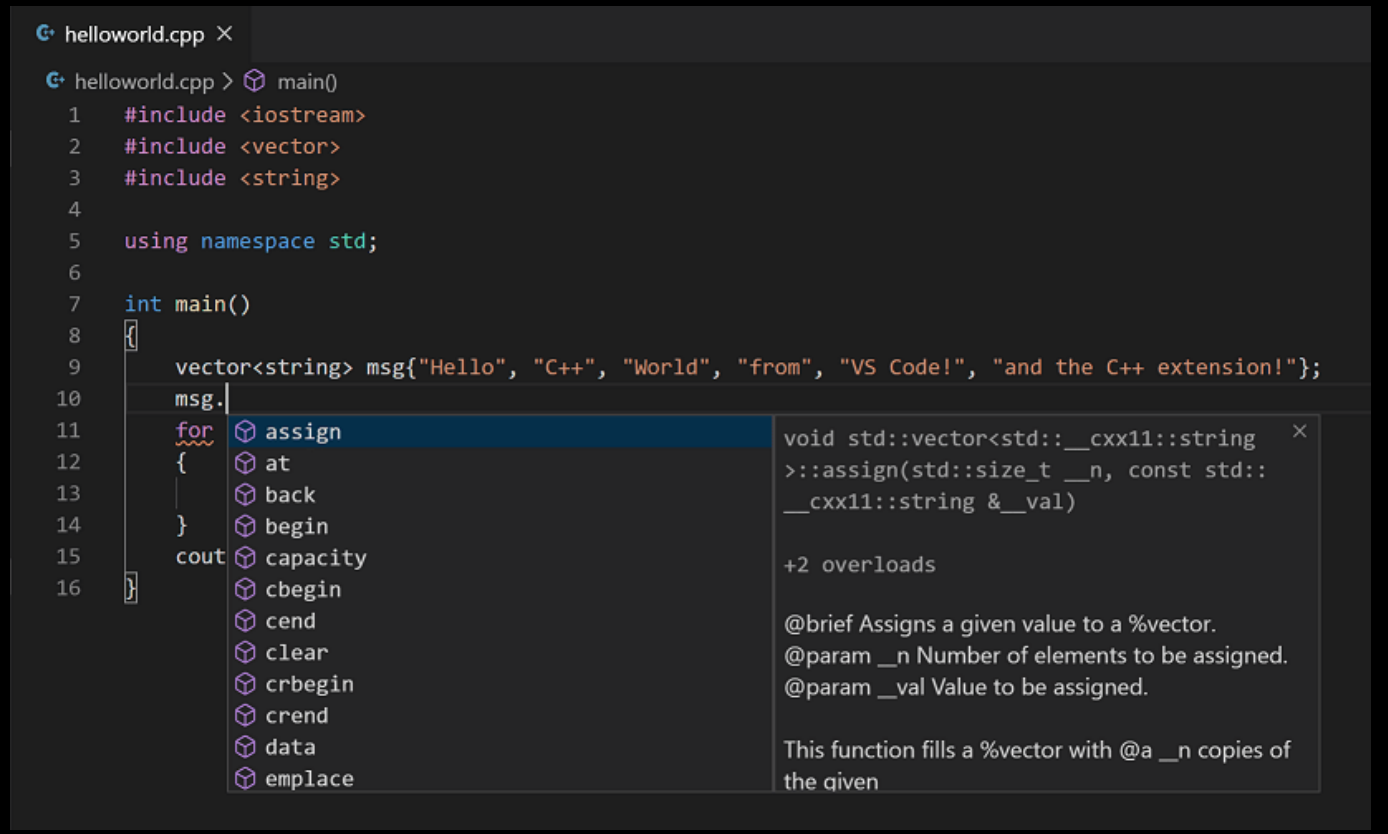
C/C++

- IntelliSense
- Syntax Highlighting
- General GDB debugging
- C/C++ Extension Pack includes additional extensions



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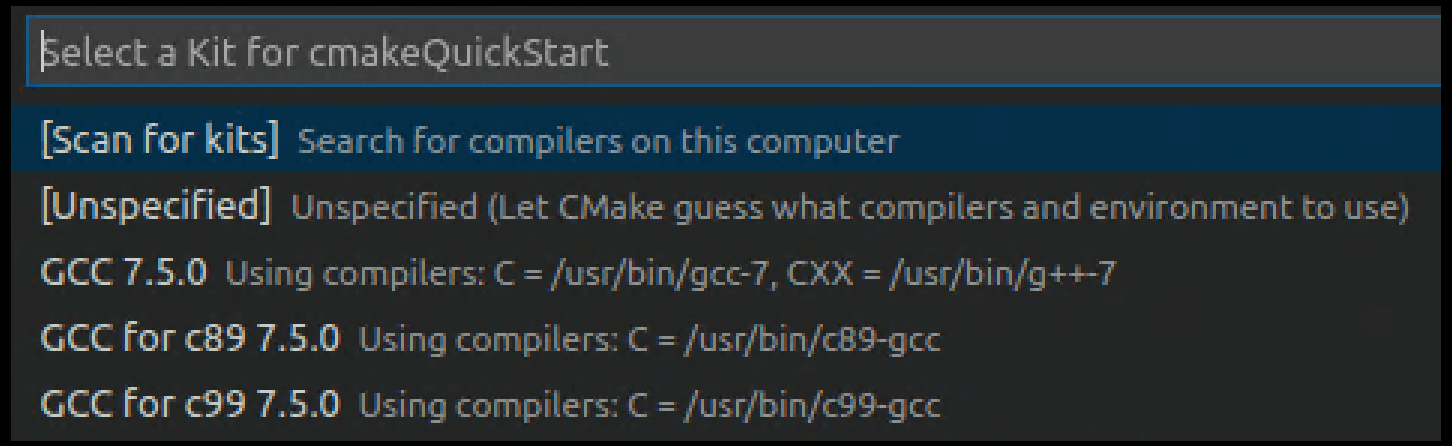
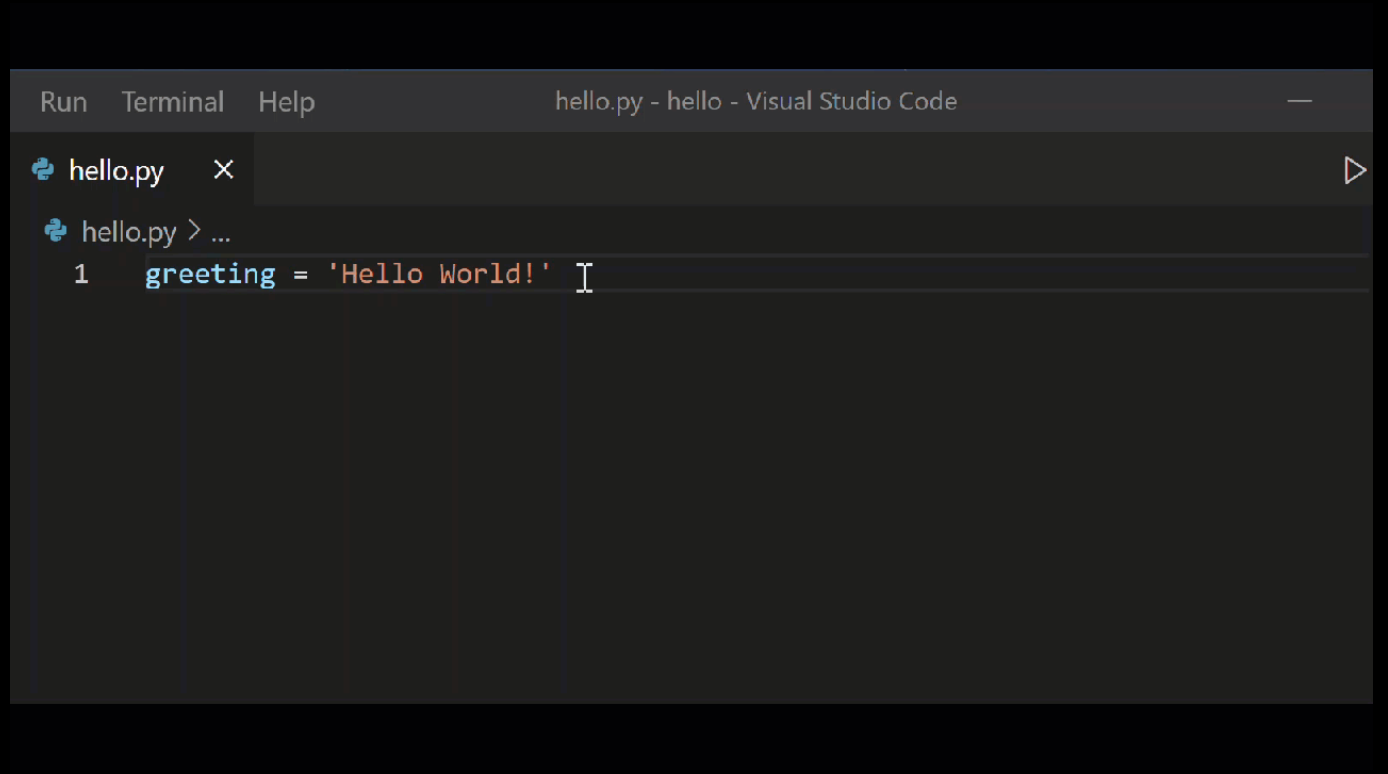
CMake

- Configure, build & debug CMake
- Includes presets (but not for embedded)
- Included in C/C++ Pack



Python

- All the Python things
- Mostly focused on data science and Python web devs



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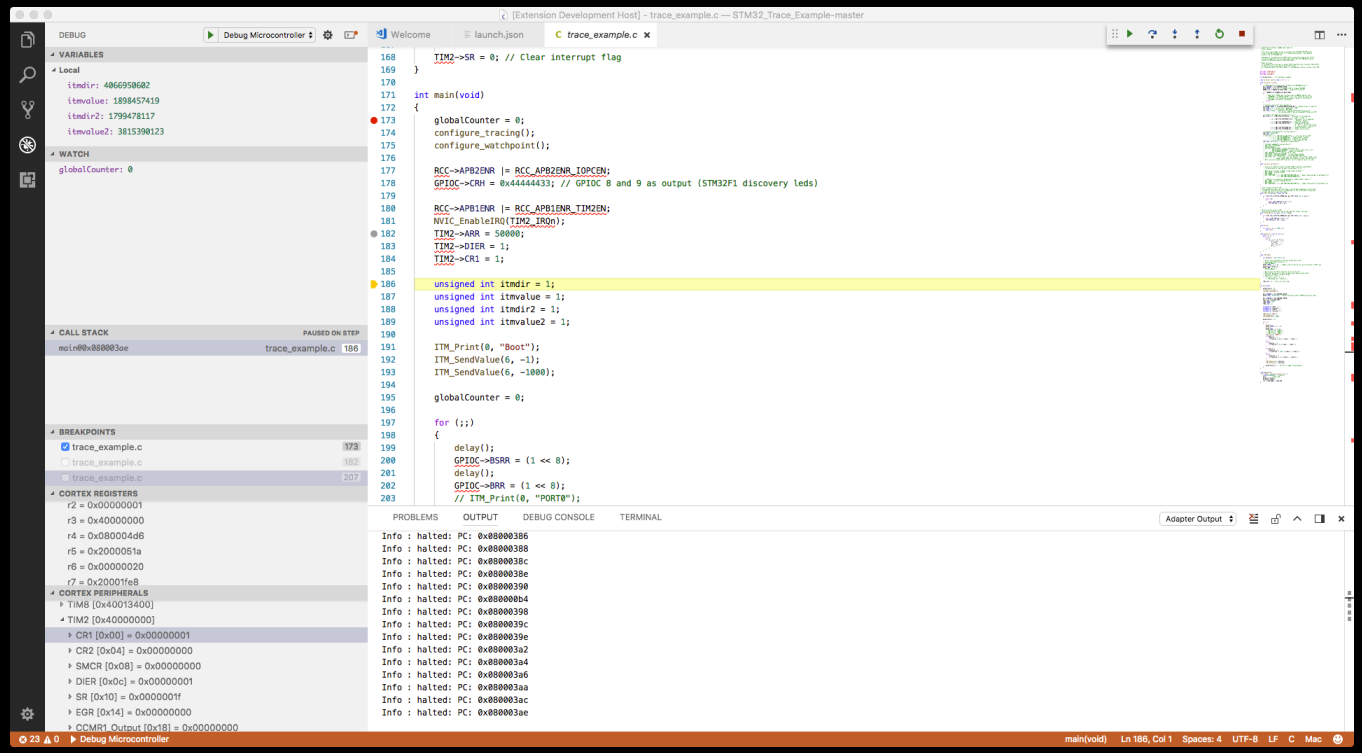
Debugging: Cortex Debug

- First and popular open source debugger for embedded
- OpenOCD, JLink, others
- RTOS aware
- Advanced features like ITM graphing



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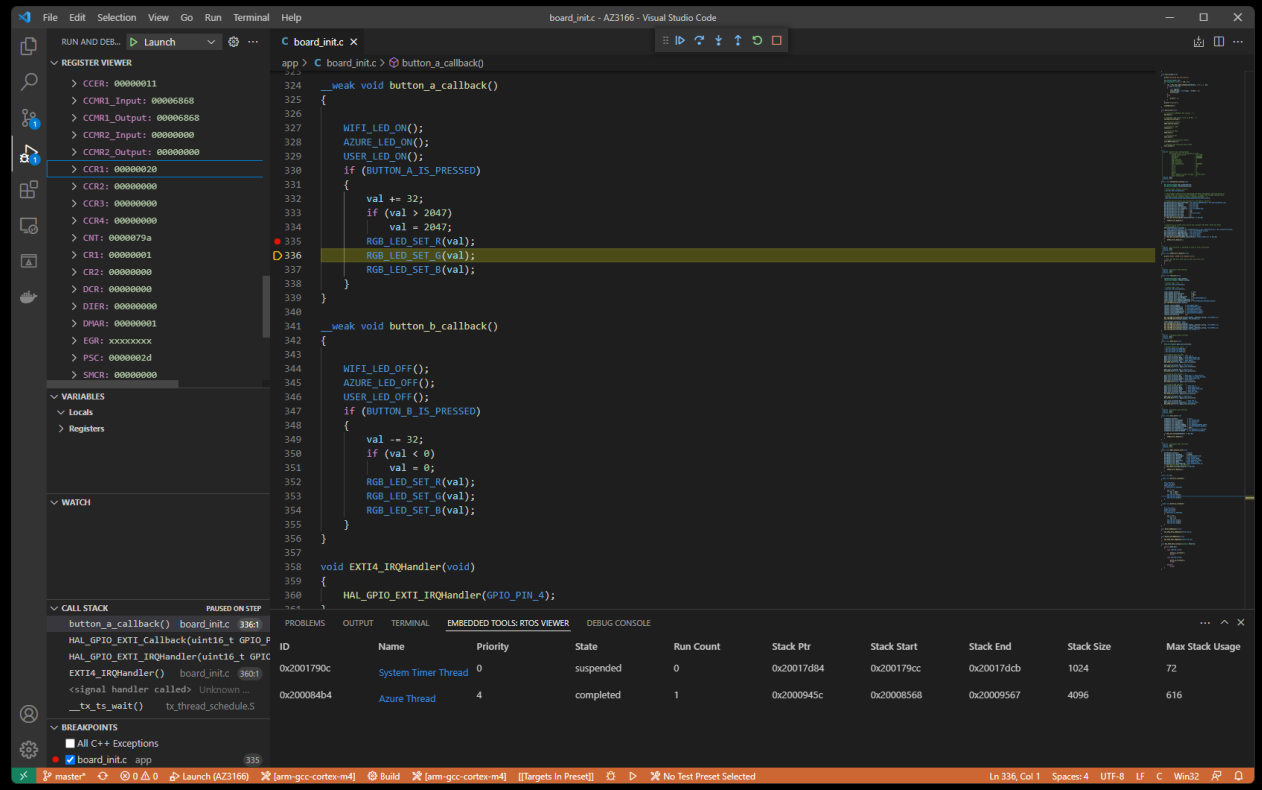
Debugging: Embedded Tools from Microsoft

- Newer debugger from C++ team
- RTOS aware
- Early Zephyr support



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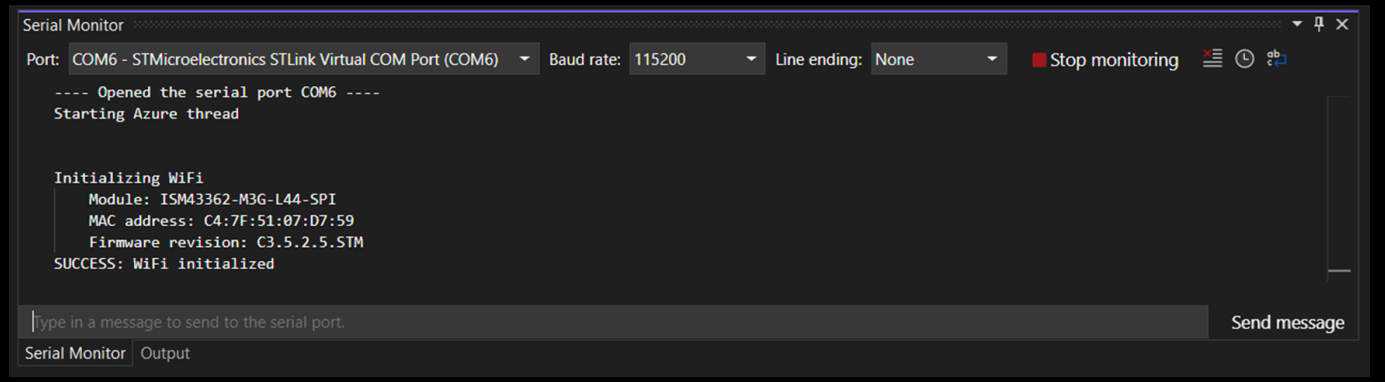
Serial Monitor from Microsoft

- Integrated into terminal
- Multiple instances
- Consistent across OS



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Optional, General

- Python Environment Manager
- YAML, RST
- Github Pull Requests & Github Repos
- Remote Development pack
- Docker

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Configuring VS Code

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How VS Code does configurations

- GUI or JSON
- Special JSON file names
- Special file location
- Automatically loaded
- Autocompletion

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settings.json

```
{
  // Hush CMake
  "cmake.configureOnOpen": false,

  // IntelliSense
  "C_Cpp.default.compilerPath": "${userHome}/zephyr-sdk-0.16.1/arm-zephyr-eabi/bin/arm-zephyr-eabi-
gcc.exe",
  "C_Cpp.default.compileCommands": "${workspaceFolder}/build/compile_commands.json",

  // File Associations
  "files.associations": {}
}
```

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tasks.json

```
{
    "version": "2.0.0",
    "tasks": [
        {
            "label": "West Build",
            "type": "shell",
            "group": {
                "kind": "build",
                "isDefault": true
            },
            "linux": {
                "command": "${userHome}/zephyrproject/.venv/bin/west"
            },
            "windows": {
                "command": "${userHome}/zephyrproject/.venv/Scripts/west.exe"
            },
            "osx": {
                "command": "${userHome}/zephyrproject/.venv/bin/west"
            },
            "args": [
                "build",
                "-p",
                "auto",
                "-b",
                "nrf52840dk_nrf52840"
            ],
            "problemMatcher": [
                "$gcc"
            ]
        }
    ]
}
```

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launch.json

```
{
    "version": "0.2.0",
    "configurations": [
        {
            "name": "Launch",
            "device": "nRF52840_xxAA",
            "cwd": "${workspaceFolder}",
            "executable": "build/zephyr/zephyr.elf",
            "request": "launch",
            "type": "cortex-debug",
            "runToEntryPoint": "main",
            "servertype": "jlink",
            "gdbPath": "${userHome}/zephyr-sdk-0.16.1/arm-zephyr-eabi/bin/arm-zephyr-eabi-gdb",
            "preLaunchTask": "West Build"
        }
    ]
}
```

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extensions.json

```
{
    "recommendations": [
        "ms-vscode.cpptools-extension-pack",
        "ms-python.python",
        "ms-vscode.vscode-embedded-tools",
        "ms-vscode.vscode-serial-monitor",
        "marus25.cortex-debug",
        "donjayamanne.python-environment-manager"
    ]
}
```

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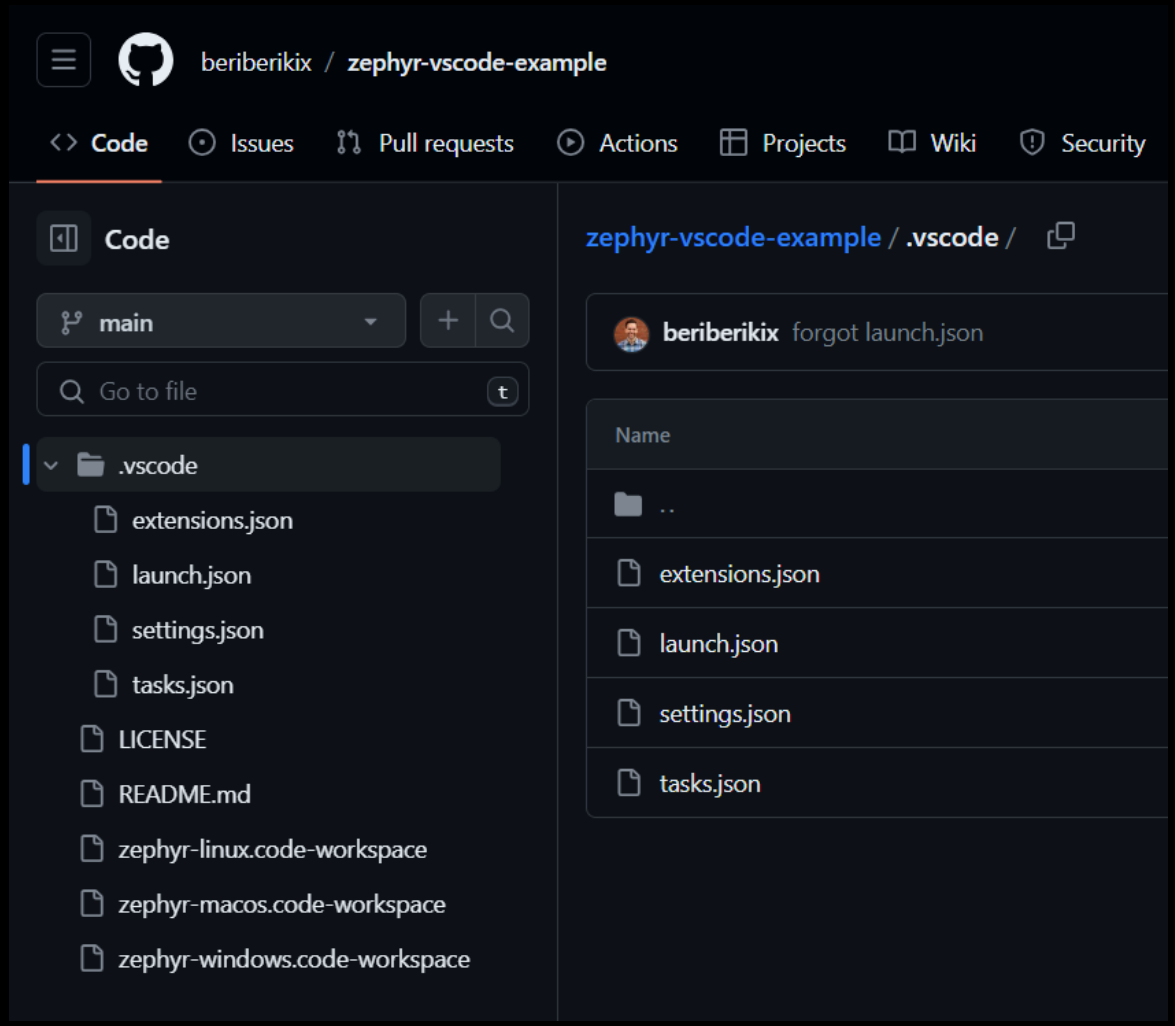
.vscode folder



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Workspaces & .code-workspace

- VS Code "project file"
- Combine .vscode files
- Portable, shareable
- Git-friendly

```
{
    "folders": [
        {
            "path": "."
        }
    ],
    "settings": {
        // Hush CMake
        "cmake.configureOnOpen": false,

        // IntelliSense
        "C_Cpp.default.compilerPath": "${userHome}/zephyr-sdk-0.16.1/arm-zephyr-eabi/bin/arm-zephyr-
eabi-gcc",
        "C_Cpp.default.compileCommands": "${workspaceFolder}/build/compile_commands.json",

        // File Associations
        "files.associations": {}
    },
    "tasks": {},
    "launch": {},
    "extensions": {}
}
```

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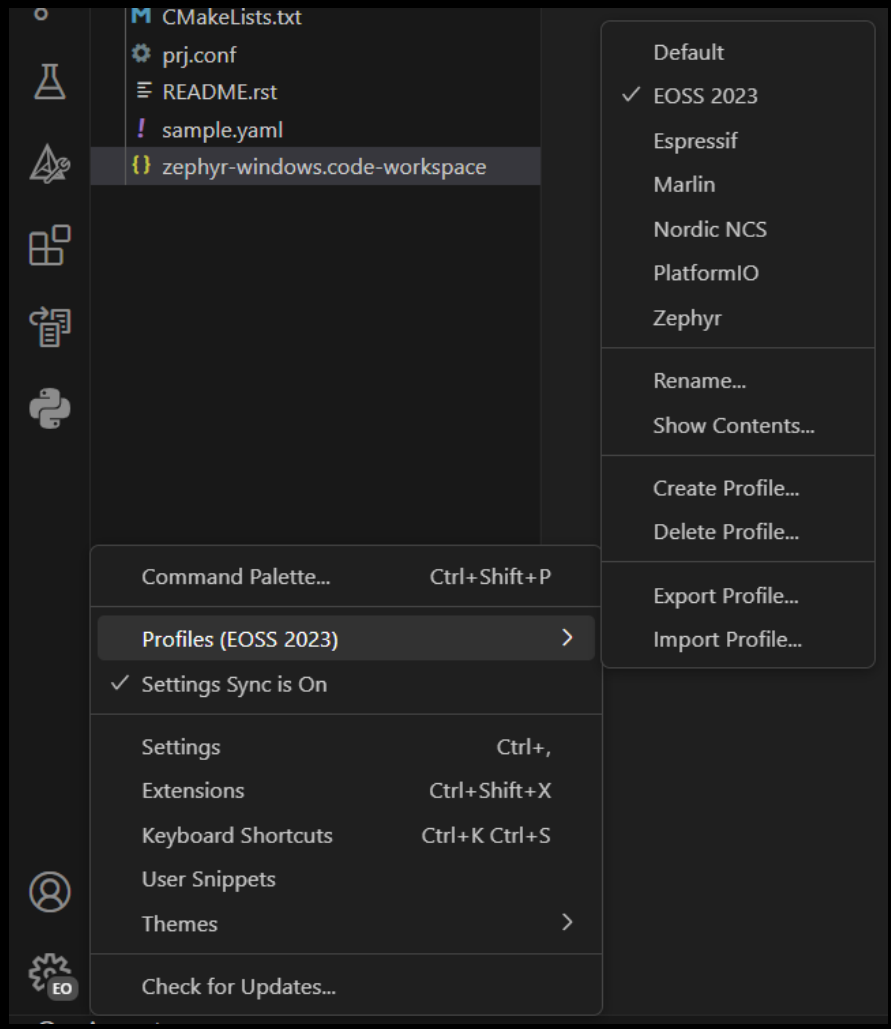
Profiles

- VS Code "environment file"
- Editor-wide configuration
- Also portable, shareable & Git



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Live Demo

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What we saw

- Preset settings & recommended extensions
- Tasks for calling west to build, flash & debug
- Using Workspaces
- IntelliSense
- https://github.com/beriberikix/zephyr-vscode-example

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Future Topics

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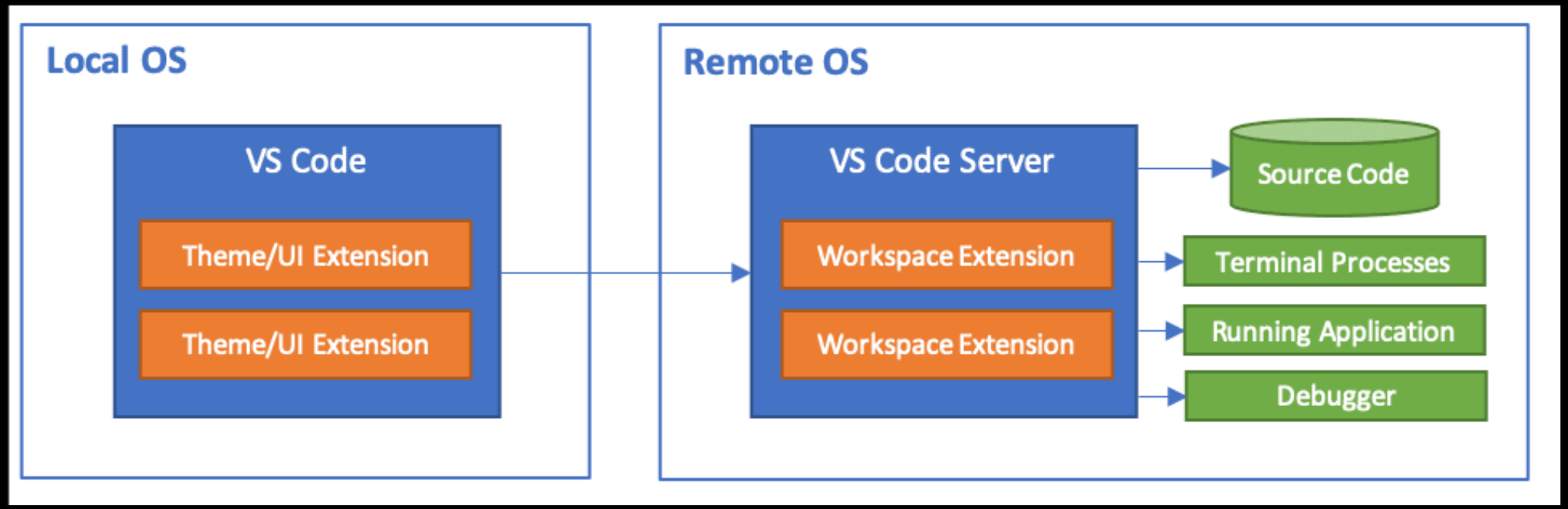
Remote Development



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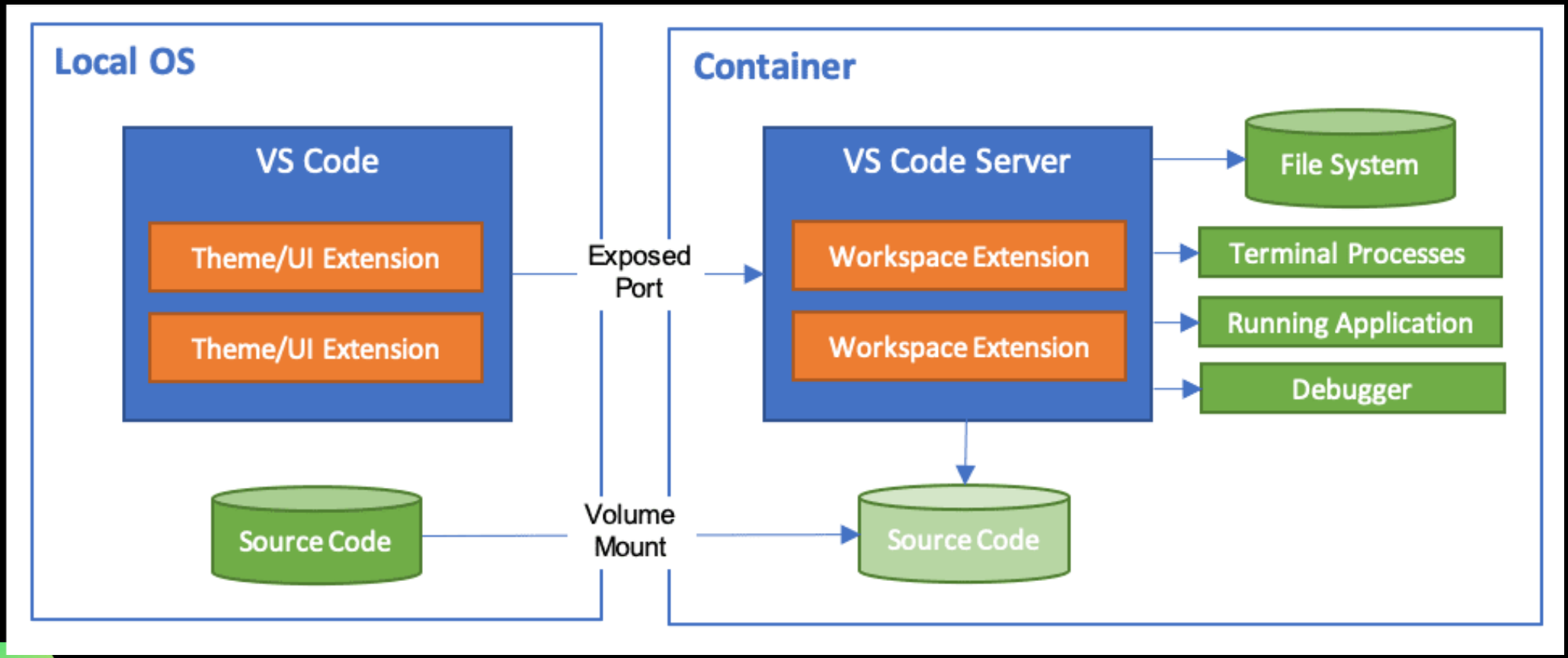
Devcontainers & Docker



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GitHub Codespace

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Wrapping Up

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Lessons

- VS Code is nearly infinitely configurable
  - Figuring what to configure is half the battle
- You can use it for embedded, today
- Use vendor extensions!

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Special Thanks

- zmk.dev community - awesome docs
- Marc Goodner, C++ @ Microsoft

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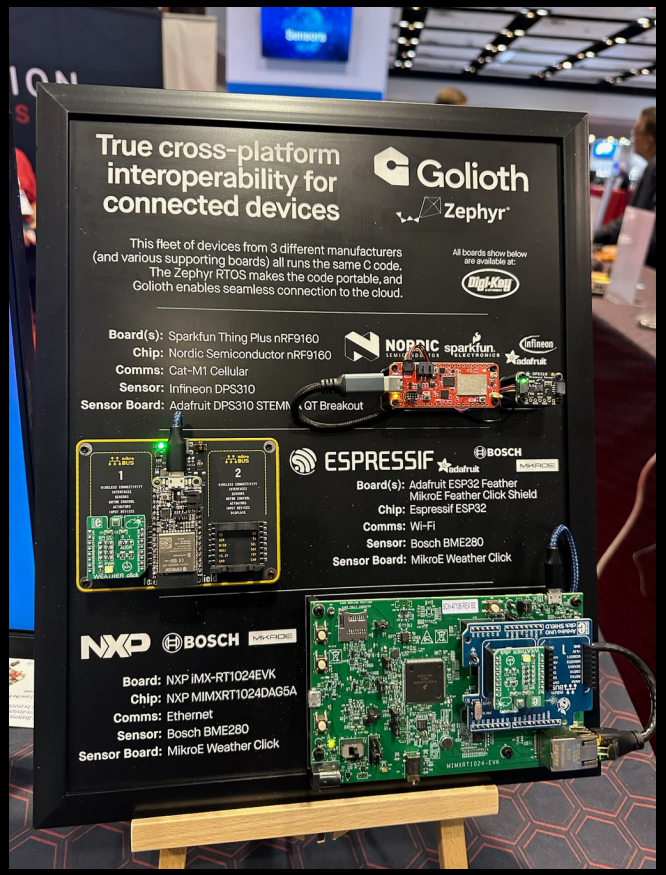
Thank you for attending!

- Come check out the Golioth booth (#41) to see hardware in action!
- Main site: golioth.io
- Golioth Blog: blog.golioth.io
- Golioth Forum: forum.golioth.io
- With the Golioth Dev Tier, your first 50 devices are free!



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