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Building a Custom OS

Introduction to Yocto Project

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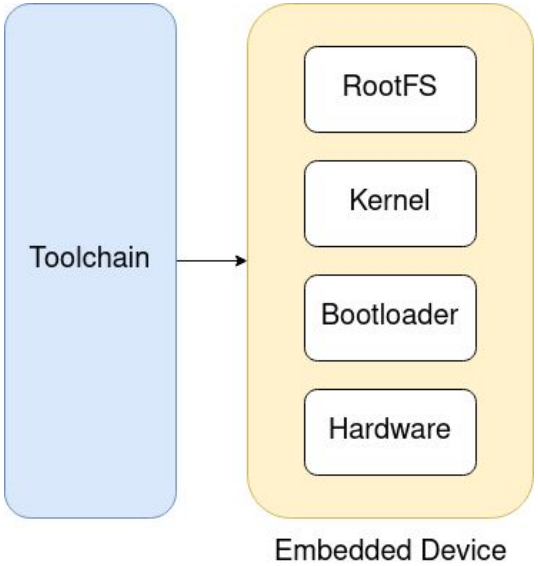
Introduction.

Importance of **Linux in Today's Industry**

- Linux is ubiquitous
- Billions of devices across the world are using a Linux-based OS
- You may have heard of a few of them...

Embedded Linux System **Simplified**



Managing **Linux Integration**

Roll-your-own (RYO) Distro

- Very flexible
- Hard to track dependencies
- Hard to reproduce
- Learning curve

Binary Distro

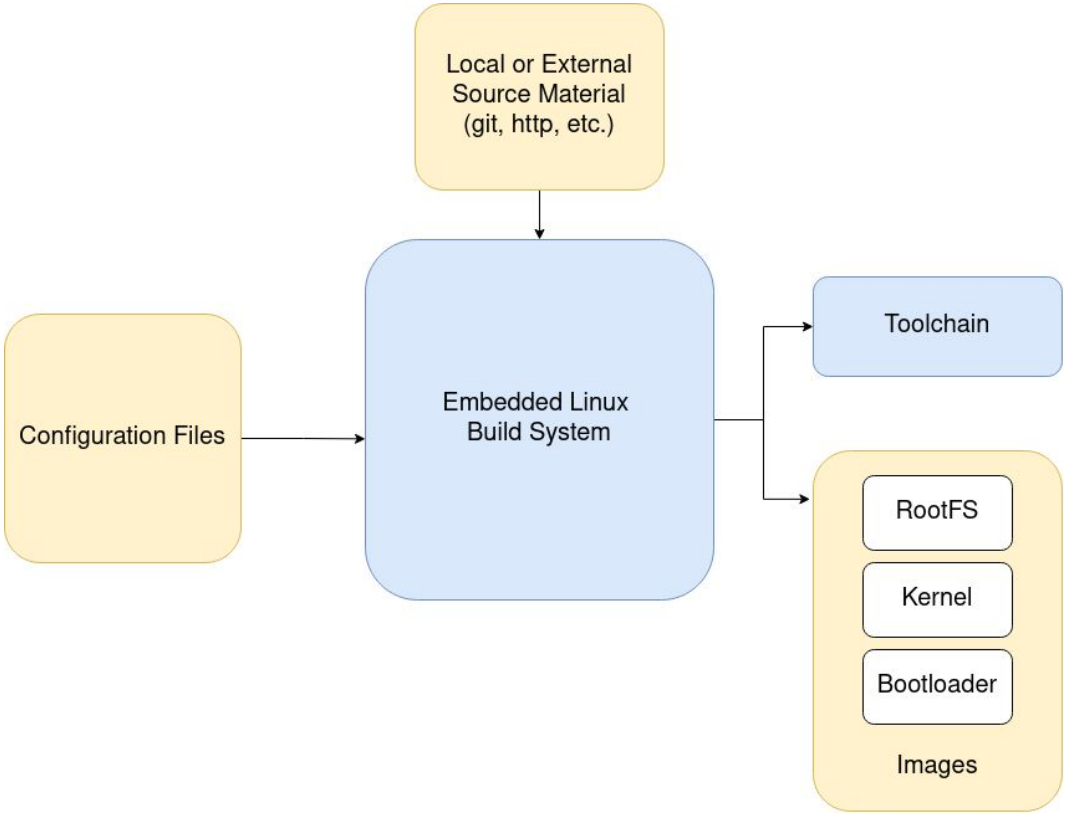
- Easy to use
- Full of unwanted dependencies
- Hard to optimize
- Big binary size

Build System

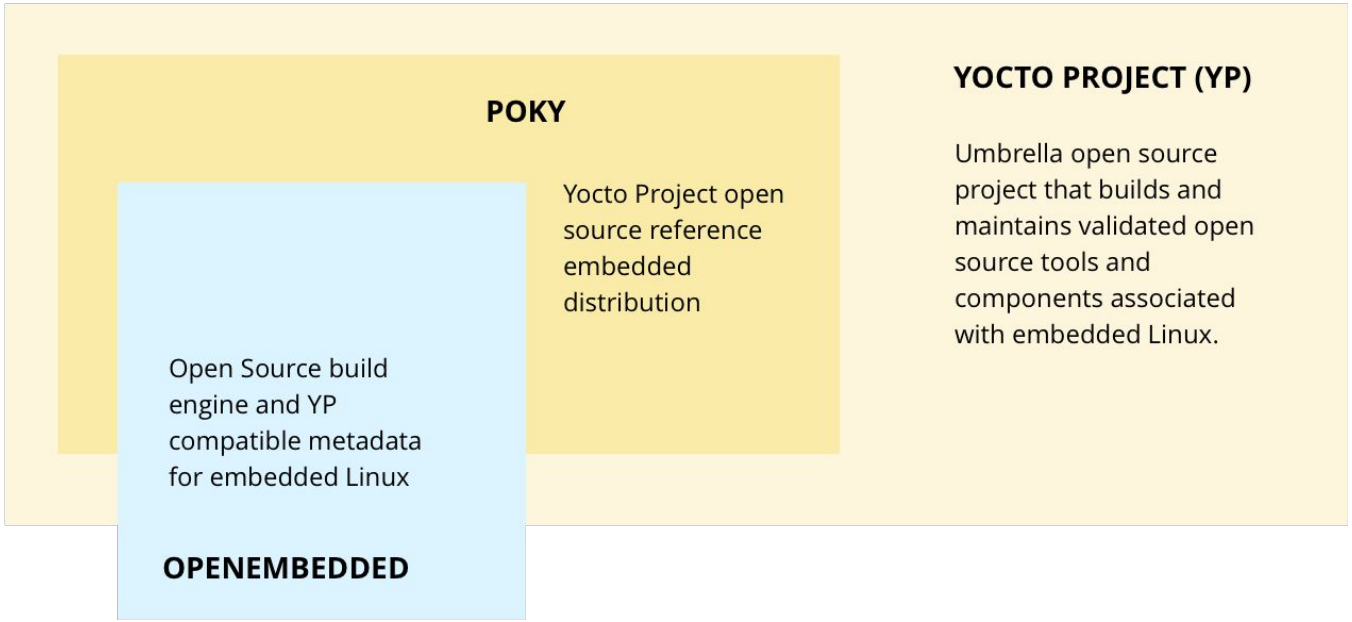
- Very flexible
- Easy to reproduce
- Small binary size
- Build time is significant
- Learning curve

Yocto Project.

Yocto **Building Blocks**

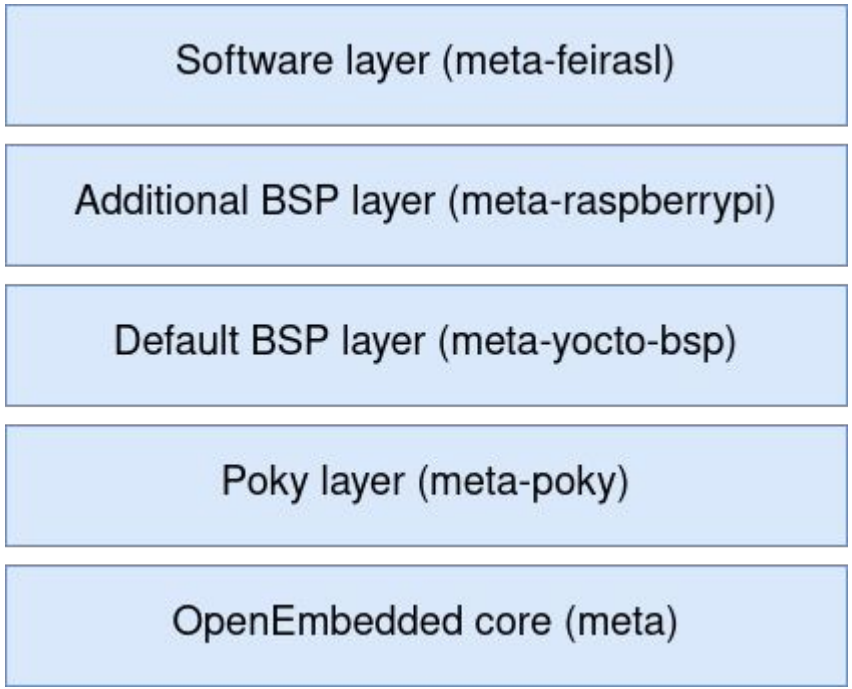


Yocto **Core Entities**



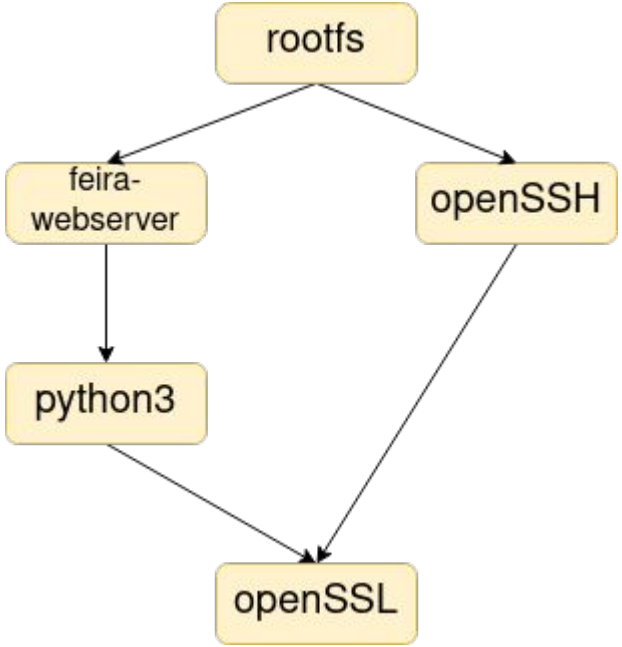
Yocto Tools & Concepts - **The Layer Model**

- The build system uses a **layer-based Model**
- Layers are modular sets of **metadata**
- Contain configurations, classes and **recipes**
- Easier to **collaborate** and **reuse**
- Metadata is the fuel of **BitBake**



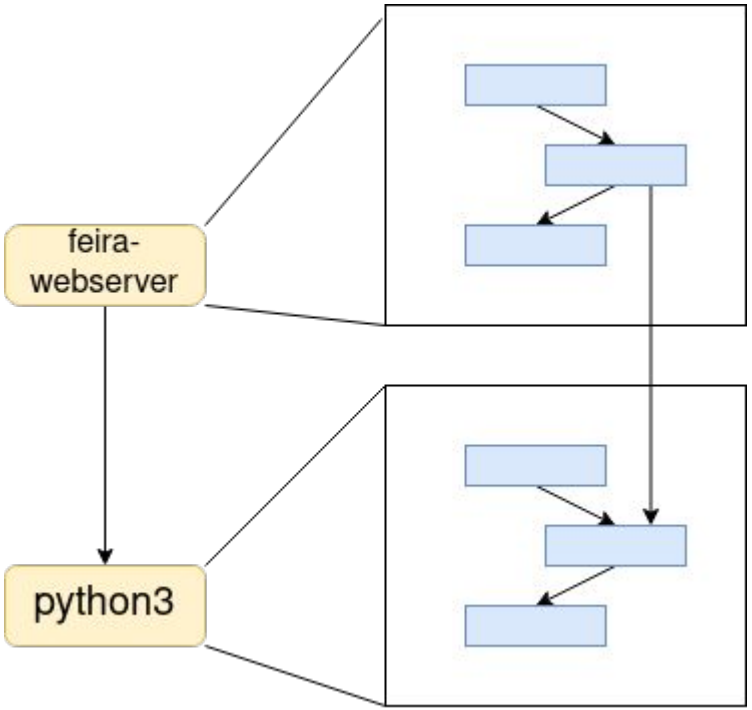
Yocto Tools & Concepts **- Recipes**

- Contain metadata related to a **unit of software.**
- Use the **.bb** extension
- Describe how to **fetch**, **build** and **install** the software
- Can be extended.
- Classes are recipes that can be used inherited by other recipes.



Yocto Tools & Concepts **- Tasks**

- Recipes are composed of **tasks.**
- Examples: do_fetch(), do_patch(), do_compile()
- There are **dependencies** between tasks.



Yocto Tools & Concepts - **Releases**

- Yocto is organized by Releases
- Layers organize branches for each release.
- Can be used to ensure layer compatibility.

Codename	Version	Release Date
Scarthgap	4.5	April, 2024
Kirkstone	4.0	May, 2022
Dunfell	3.1	April, 2020

Let’s Build Something.

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Part 1
Yocto Basic Setup.

1. **Setting up the build environment**
   - Prepare build directory
   - Clone poky and additional layers
   - Install dependencies
   - Use scripts to set environment

2. **Starting your first build**
   - Understanding bitbake flags and arguments
   - Build recipes and images
   - Inspect and debug recipes

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Part 2
Extending Yocto.

1. **Create a new layer**
   - meta-fsl
2. **Extend an existent recipe**
   - Customise the os-release recipe
3. **Create a new recipe**
   - Installs a web server
   - Configure systemd to start the server
4. **Update image and distro configurations**
   - Distro vs Image
   - Distro changes: init system to systemd
   - Image changes: install our application
5. **Image rebuild**
   - Build the new image and flash target

Bibliography

- Yocto Project Documentation - https://docs.yoctoproject.org/
- Yocto Project Youtube Channel - https://www.youtube.com/@TheYoctoProject/videos
- Mastering Embedded Linux Programming - Third Edition - Frank Vasquez, Chris Simmonds
- Chris Simmonds Talks - https://www.2net.co.uk/
- Bootlin - https://bootlin.com/

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