Yocto Project and OpenEmbedded: Recent Changes and Future Directions

Antonin Godard

antonin.godard@bootlin.com
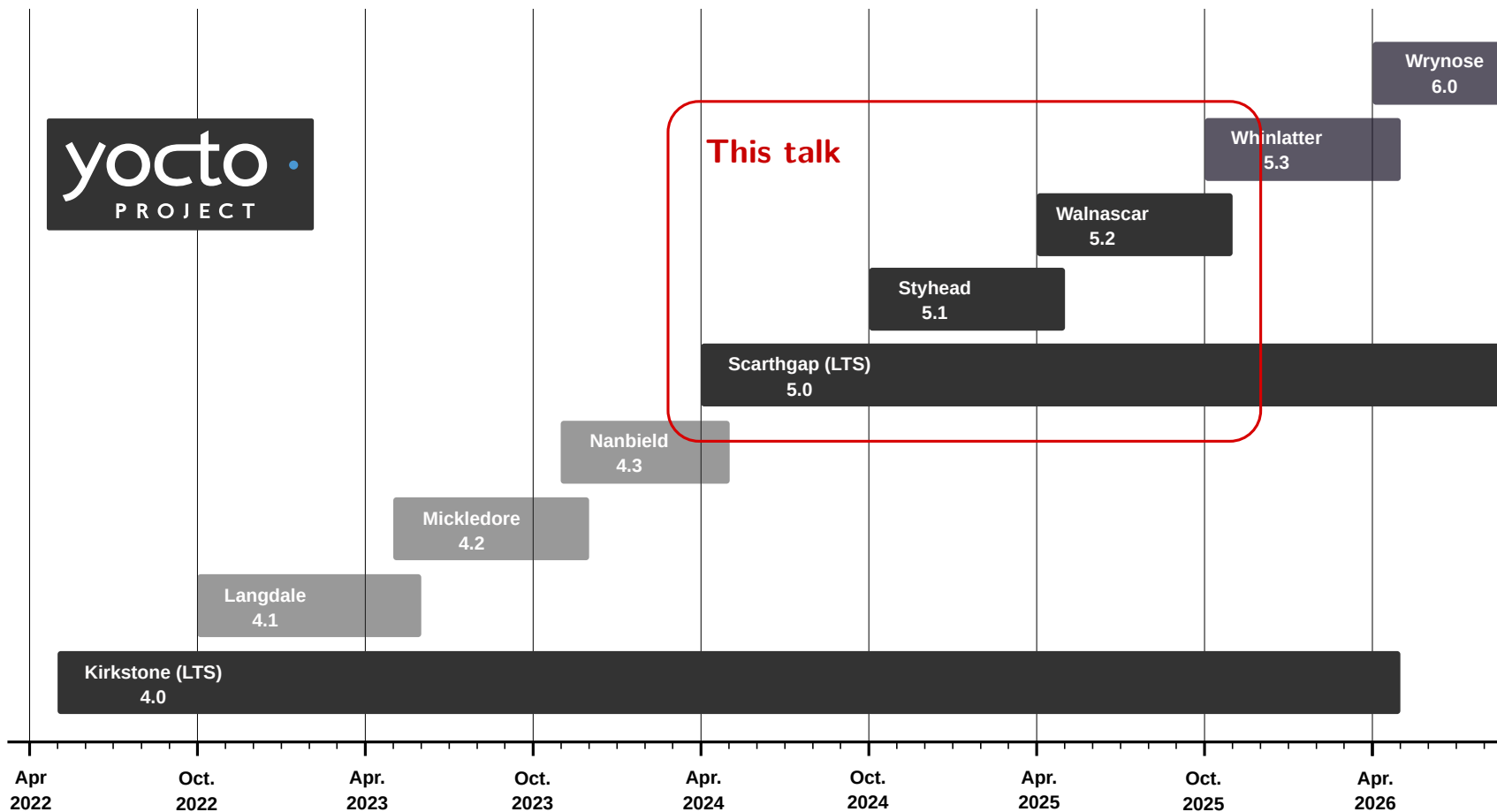
Embedded Recipes 2025

Antonin Godard

▶ Embedded Linux engineer and trainer
at *Bootlin*
  - Yocto expertise
  - Participant to the build engineering
    effort (Autobuilder)
▶ Maintainer of the **Yocto Project**
official documentation
▶ Living in *Lyon*, France

Source: https://docs.yoctoproject.org/dev/_images/releases.svg (modified)

Users and dependencies

▶ New USERADD_DEPENDS variable
▶ Allows using the users and groups created by another recipe

recipe-1.bb:

```
inherit useradd

# group is created here
GROUPADD_PARAM:${PN} = "-r mygroup"
```

recipe-2.bb:

```
inherit useradd

USERADD_DEPENDS += "recipe-1"
# used there
USERADD_PARAMS:${PN} = "--gid mygroup user2"
```

`new in scarthgap`

▶ Generate IDE configurations (VSCode by default)
- Remote debugging
- Cross-development

▶ Bootstraps an SDK (alternative to `populate_sdk`)

▶ Three steps:
1. Top-level configurations as described `here`
2. `devtool modify my-recipe`
3. `devtool ide-sdk my-recipe core-image-minimal --target root@<target ip>`

▶ Would place new config file in the source directory (e.g. `CMakePresets.json`)

▶ More: `https://docs.yoctoproject.org/dev/dev-manual/devtool.html#devtool-ide-sdk-configures-ides-and-bootstraps-sdks`

`new in scarthgap`

Unpacking changes

▶ The following will now produce an error:

```
S = "${WORKDIR}"
```

▶ Use UNPACKDIR instead:

```
S = "${WORKDIR}/sources"
UNPACKDIR = "${S}"
```

▶ WORKDIR should not be referenced for file manipulations

```
install -m 0644 ${UNPACKDIR}/file.conf ${D}${sysconfdir}
```

`new in styhead`

Configuration fragments

▶ Abstract a family of configurations

▶ `meta/conf/fragments/yocto-autobuilder/resource-constraints.conf`

```
BB_CONF_FRAGMENT_SUMMARY = "Resource constraint variables"
BB_CONF_FRAGMENT_DESCRIPTION = "..."
BB_NUMBER_THREADS = '16'
PARALLEL_MAKE = '-j 16 -l 75'
...
```

▶
```
addfragments conf/fragments OE_FRAGMENTS OE_FRAGMENTS_METADATA_VARS
```

```
OE_FRAGMENTS += "core/yocto-autobuilder/autobuilder-resource-constraints"
```

▶ Used for `bitbake-setup`

▶ More: https://docs.yoctoproject.org/bitbake/bitbake-user-manual/bitbake-user-manual-metadata.
html#addfragments-directive

`new in walnascar`

▶ When you need to include a file present in multiple layers

```
meta-layer-foo
└── conf
    └── include
        └── maintainers.inc
meta-layer-bar
└── conf
    └── include
        └── maintainers.inc
meta-layer-baz
└── conf
    └── maintainers.inc
```

distro.conf:

```
include_all maintainers.inc
```

▶ The order depends on BBLAYERS

new in walnascar

Compressing linux firmwares

- ▶ New variable `FIRMWARE_COMPRESSION`
  - Allows significant disk space savings by compressing firmwares
  - Empty by default (no compression)
  - Can be `xz` or `zst`
  - Kernel needs to be built with `CONFIG_FW_LOADER_COMPRESS_XZ` or `CONFIG_FW_LOADER_COMPRESS_ZSTD`

Running `du -b` on `${D}` (all firmwares installed):

None	xz	zstd
1488 MB	596 MB	705 MB

`new in walnascar`

debug-tweaks feature removed

▶ The `debug-tweaks image feature` has been **removed**

▶ Can be easily replaced by stating each debug feature explicitely:

```
IMAGE_FEATURES += "\
    allow-empty-password \
    allow-root-login \
    empty-root-password \
    post-install-logging \
"
```

`new in walnascar`

Kernel and Yocto LTS

▶ Linux kernel LTS now have a **2 year** lifespan

▶ Yocto LTS releases have a **4 year** lifespan

▶ **The default kernel will be upgraded during the midpoint of the LTS lifecycle**

▶ The previous kernel recipe will be left, but not updated

Longterm release kernels

Version	Maintainer	Released	Projected EOL
6.12	Greg Kroah-Hartman & Sasha Levin	2024-11-17	Dec, 2026
6.6	Greg Kroah-Hartman & Sasha Levin	2023-10-29	Dec, 2026
6.1	Greg Kroah-Hartman & Sasha Levin	2022-12-11	Dec, 2027
5.15	Greg Kroah-Hartman & Sasha Levin	2021-10-31	Dec, 2026
5.10	Greg Kroah-Hartman & Sasha Levin	2020-12-13	Dec, 2026
5.4	Greg Kroah-Hartman & Sasha Levin	2019-11-24	Dec, 2025

Source: https://www.kernel.org/category/releases.html

▶ Discussion thread:

https://lore.kernel.org/r/CAOSpxdbC-=6htz0g8i8NpcrmTsTpDXM0AkxtAO334KHEmKgu5Q@mail.gmail.com

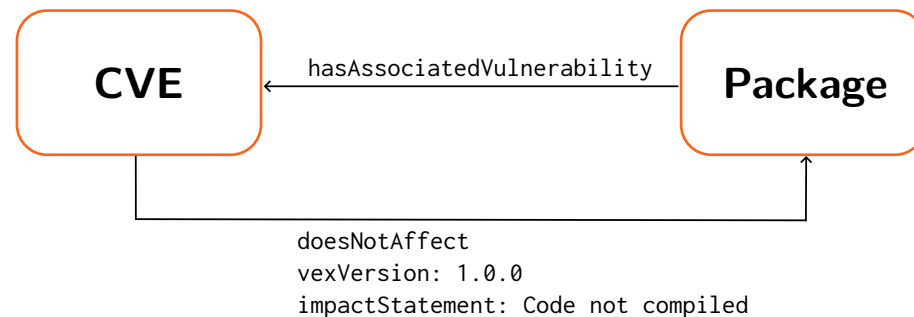# SPDX 3

- ▶ Several improvements over SPDX2:
  - Produces a unique JSON output SPDX document for the image
  - Can describe the build process that occurred at a point in time
  - SDPX3 implements a vulnerability tracking mechanism (VEX-compliant)

Source: Automated SBoM generation with OpenEmbedded and the Yocto Project, Joshua Watt (2023)

- ▶ See also:
  - https://spdx.github.io/spdx-spec/v3.0.1
  - Automated SBoM generation with OpenEmbedded and the Yocto Project
  - SPDX in the Yocto Project

`new in styhead`

Future of CVE checking?

▶ The `cve-check` class currently relies on the National Vulnerability Database (NVD)

▶ The NVD database has been missing `CPEs` since the beginning of 2024

```
cpe:2.3:o:linux:linux_kernel:*:*:*:*:*:*:*:*
```

These allow identifying the vulnerable software component

▶ **Current CVE reports may look good but are missing known vulnerabilities**

▶ Need for an alternate database or tool

▶ May rely on SPDX3

▶ More information:
https://lore.kernel.org/r/7D6E419E-A7AE-4324-966C-3552C586E452@arm.com

Clang support in OE-Core

▶ Ongoing progress to support Clang as an optional default toolchain:
https://lore.kernel.org/r/20250424-clang-merge-v1-0-5a492a8461aa@gmail.com

▶ `meta/conf/toolchain/clang.inc`:

```
CC = "${CCACHE}${HOST_PREFIX}clang ${HOST_CC_ARCH}${TOOLCHAIN_OPTIONS}"
...
PREFERRED_PROVIDER_virtual/cross-cc = "${MLPREFIX}clang-cross-${TARGET_ARCH}"
```

Also see

▶ The `inherit_defer` directive for inherits that use conditionals (`inherit_defer ${@bb.utils.contains(...)}`)

▶ The `testimage` class can now send commands over serial (`TEST_SERIALCONTROL_CMD`)

▶ The `cve-json-to-text.py` script for human-readable `cve-check` outputs

▶ `bblock` to lock a task and save time during development

▶ New sanity checks and previous warnings now producing errors: `https://docs.yoctoproject.org/ref-manual/qa-checks.html`

▶ Release notes
  - `https://docs.yoctoproject.org/dev/migration-guides/release-5.0.html`
  - `https://docs.yoctoproject.org/dev/migration-guides/release-5.1.html`
  - `https://docs.yoctoproject.org/dev/migration-guides/release-5.2.html`

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