Survey of 3rd Party Yocto Tools

Joshua Watt
Yocto Project Summit

About Me

- Worked at Garmin since 2009
- Using OpenEmbedded & Yocto Project since 2016
- Member of the OpenEmbedded Technical Steering Committee (TSC)
- Joshua.Watt@garmin.com
- JPEWhacker@gmail.com
- IRC (OFTC or libera): JPEW
- Twitter: @JPEW_dev
- LinkedIn: joshua-watt-dev

Outline

- Layer Source Code Management
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    - Git submodules
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- Build Environment
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- Configuration Management
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Why Cover This?

- Education on available options
- Broadening of perspective
  - Important when discussing layer setup options to be added to the project

Specifically, this presentation is **not** intended to say one method is "better" than another

Nothing up my sleeves!

This is intended to be unbiased; however:

- I wrote Pyrex and Whisk
- I use Git submodules

Layer Source Code Management

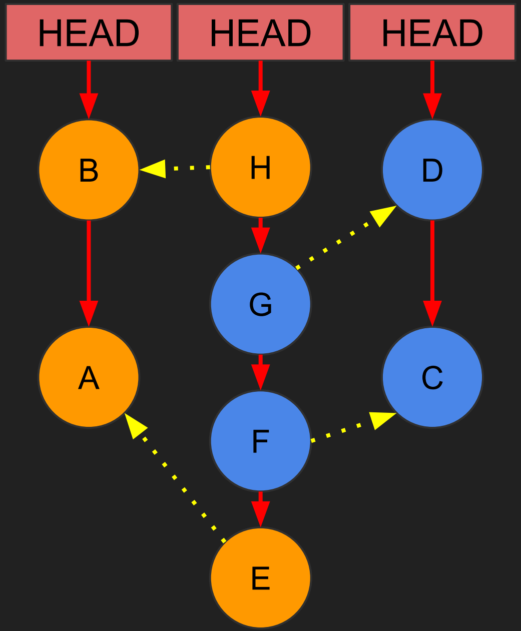
Layer Source Code Management

- How are other layers pulled into our builds?
- How are new changes pulled from upstream?
- How are changes pushed back to upstream?

combo-layer

combo-layer

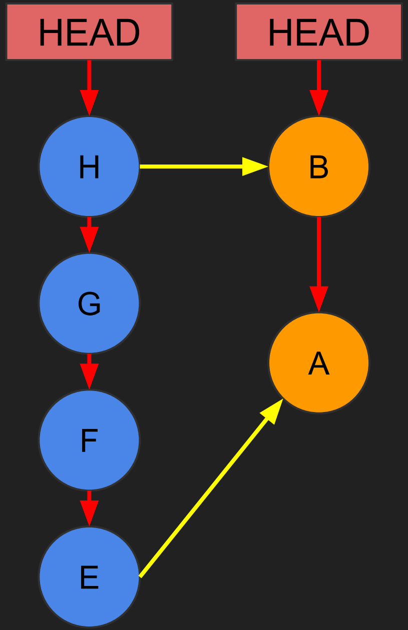
- https://wiki.yoctoproject.org/wiki/Combo-layer
- Python script in OE-core
- Pulls multiple repositories together into a single git tree
- Used to manage Poky



Git submodules

Git submodules

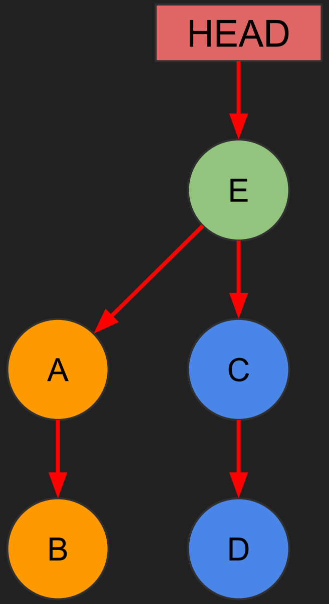
- Integrated into Git
- Sub-repositories just another git repo in a subdirectory of the parent
- Parent repo references children by SHA-1
- Sub-repository has its own distinct git tree from parent
  - Although it lives in the parents .git directory
- Supports recursion (sub repositories can have sub repositories)
- Extra commands required to update, etc.



Git subtrees

Git subtrees

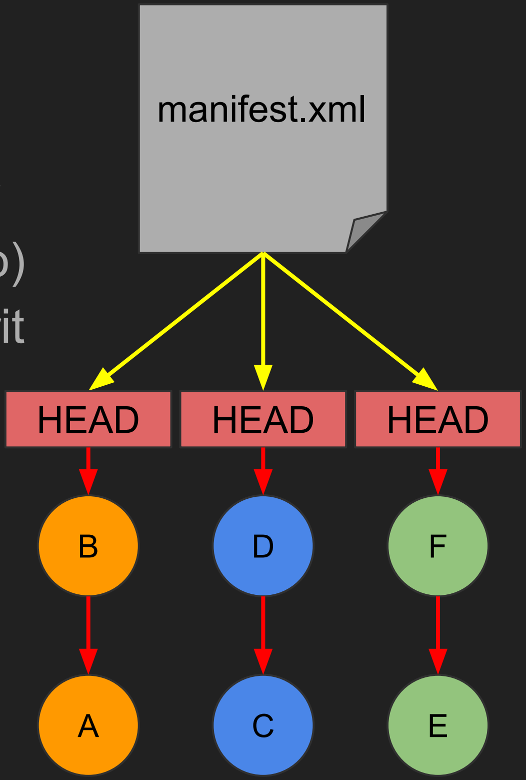
- https://www.atlassian.com/git/tutorials/git-subtree
- Pull subprojects into a single repository as additional remotes
- `git subtree` merge subproject in with a combination merge & rename commit
- Tool can also split commits from parent remote back to subprojects for upstreaming
- Single git repository is easy for users to consume (no tool or extra commands required)



Repo

Repo

- https://gerrit.googlesource.com/git-repo/
- Maintained by Google
- Used extensively in Android
- Git repositories in a project are described in a separately fetched XML manifest (usually kept in a separate git repo)
- Some code review integrations, usually for use with Gerrit
- Can track either branch heads or commit SHA-1



Build Environment

Build Environment

- Managing build dependencies
- Building across heterogeneous environment (e.g. different developers using different distros)
- Continuous Integration builds

In all cases, consistent results (reproducible!) are desired

Buildtools-tarball & uninative

Uninative

- https://docs.yoctoproject.org/singleindex.html#uninative-bbclass
- Part of OE core
- Replaces host C library for consistent build behavior across hosts; in particular so sstate can be shared
- Enabled by default

Buildtools-tarball

- https://docs.yoctoproject.org/ref-manual/system-requirements.html?highlight=buildtools#installing-a-pre-built-buildtools-tarball-with-install-buildtools-script
- Provides hosts tools required to build (e.g. GCC, binutils etc.)
- Built as an SDK out of OE-core
- Simple to enable and use
- Possible to build and publish your own if you need custom tools

CROPS

CROPS

- https://github.com/crops
- Docker containers for building Yocto projects
- Several distros images are maintained: Debian, Ubuntu Fedora, OpenSuse
- You will usually want to use poky-container as it can support creating a user in the container that matches your user
- Simple setup and usage

```
docker run --rm -it -v /home/myuser/mystuff:/workdir crops/poky --workdir=/workdir
```

Pyrex

Pyrex

- https://github.com/garmin/pyrex
- Maintained by Garmin (yours truly)
- "Transparently" redirects commands to run in a Ubuntu container
  - E.g. users still invoke `bitbake` et al.
- Multiple LTS Ubuntu version supported for running older Yocto releases on newer hosts
- Comprehensive configuration options

Configuration Management

Configuration Management

- Need to build *N* different configurations (e.g. different products) out of the same codebase
- Ensure that users can easily and reproducibly select a specific configuration to build
  - Preferably, the configurations live with the code
- Local configuration changes for experimentation?

TEMPLATECONF

TEMPLATECONF

- https://docs.yoctoproject.org/dev-manual/common-tasks.html?highlight=templateconf#creating-a-custom-template-configuration-directory
- Part of OE-core `oe-init-build-env` script
- Setting the environment variable `TEMPLATECONF` to a directory will cause OE-core to populate `conf/bblayers.conf` and `conf/local.conf` files from templates
    - Only if they don't already exists

```
$ ls conf/templates/foo
bblayers.conf.sample local.conf.sample
$ export TEMPLATECONF="$(pwd)/conf/templates/foo/"
$ . oe-init-build-env
```

Whisk

Whisk

- https://github.com/garmin/whisk
- Maintained by Garmin (yours truly)
- YAML configuration
- Optional Pyrex integration for build environment setup
- 3 axes of configuration - "product" "mode" and "site"
  - "Product" - The thing you want to build
  - "Mode" - How you want to build it (e.g. "Release", "Debug")
  - "Site" - Where you are building it from (e.g. "Jenkins", "Olathe[1]")
- Makes heavy use of Multiconfig (e.g. everything is a multiconfig)
- Per-product BBLAYERS
- Limited layer customization support

```
$ . init-build-env --product=eagle --mode=release --site=olathe
$ bitbake all-targets
```

[1] Olathe (oh-LAY-tha) is a suburb of Kansas City, Kansas, U.S.A where Garmin World Headquarters is located.

Kas

kas

- https://github.com/siemens/kas
- Maintained by Siemens
- One tool that does everything (layer management, build environment, & configuration management) with a single command
- YAML based config files
- Project YAML files may be built up hierarchically, and even pulled from other layers for complex configurations

```
$ kas build project.yaml
```

Conclusion

Questions?