Using linux-yocto as a Yocto BSP kernel

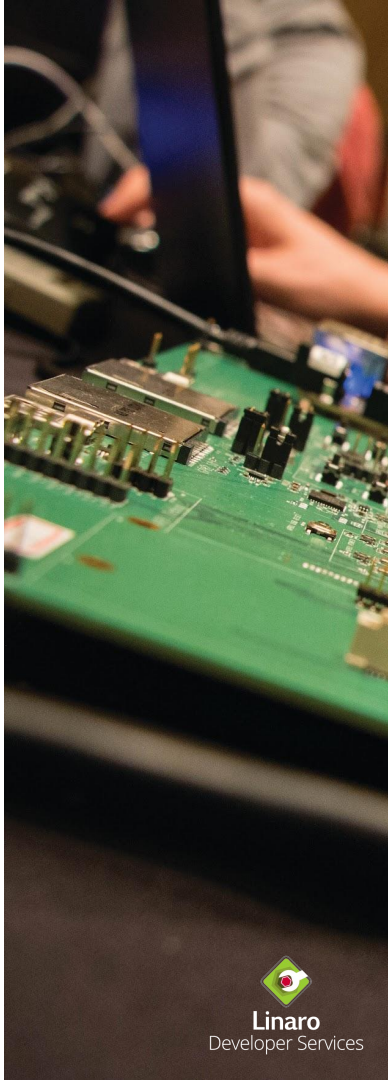
Managing your BSP kernel in a different way

Dmitry Baryshkov
mailto:dmitry.baryshkov@linaro.org

Linaro
Developer Services

About me

- OpenEmbedded contributor since 2007
  - ... and even remembers OpenZaurus
- Linux kernel contributor since 2007
  - Around 2200 commits
- worked with Linaro in 2017-2019, joined back in 2020
  - A part of Qualcomm Ecosystem Team
- meta-qcom leading developer since 2020
  - Maintainer since 2023



Typical OE BSP

From the Linux Kernel point of view

Linaro
Developer Services

linux-awesome-bsp

- Custom bb recipe in vendor’s BSP layer

linux-awesome-bsp

- Custom bb recipe in vendor's BSP layer
- SRC_URI pointing to vendor's Git tree
  - Which might track development history
  - ... or it might not
  - "Revert fix for the fix for the commit"
  - Was this patch ever shown to upstream developers?
  - LTS version if you are lucky
  - Security updates if you are extremely lucky

linux-awesome-bsp

- Custom bb recipe in vendor's BSP layer
- SRC_URI pointing to vendor's Git tree
  - Which might track development history
  - ... or it might not
  - "Revert fix for the fix for the commit"
  - Was this patch ever shown to upstream developers?
  - LTS version if you are lucky
  - Security updates if you are extremely lucky
- kernel config
  - usually a file under the same git tree
  - ... or a config file in the layer
  - Anyway, good luck modifying it in a simple but future-proof way

linux-awesome-bsp

- Custom bb recipe in vendor's BSP layer
- SRC_URI pointing to vendor's Git tree
  - Which might track development history
  - ... or it might not
  - "Revert fix for the fix for the commit"
  - Was this patch ever shown to upstream developers?
  - LTS version if you are lucky
  - Security updates if you are extremely lucky
- kernel config
  - usually a file under the same git tree
  - ... or a config file in the layer
  - Anyway, good luck modifying it in a simple but future-proof way

But everybody does it this way?!

Linaro
Developer Services

linux-yocto kernel recipe

- The kernel recipe used by OE-Core for the QEMU targets
- Also BSP for several standard platforms
- Follows linux-stable releases
- Tracks the latest released kernel and LTS kernels
- Has very powerful kernel configuration framework (scc)
- Endorsed by YoctoProject Compatible Layer

linux-yocto kernel recipe

- The kernel recipe used by OE-Core for the QEMU targets
- Also BSP for several standard platforms
- Follows linux-stable releases
- Tracks the latest released kernel and LTS kernels
- Has very powerful kernel configuration framework (scc)
- Endorsed by YoctoProject Compatible Layer

Sounds perfect, doesn't it?

But nobody uses it. Almost.

linux-yocto kernel recipe

- The kernel recipe used by OE-Core for the QEMU targets
- Also BSP for several standard platforms
- Follows linux-stable releases
- Tracks the latest released kernel and LTS kernels
- Has very powerful kernel configuration framework (scc)
- Endorsed by YoctoProject Compatible Layer

Sounds perfect, doesn't it?

But nobody uses it. Almost.

We do. Now!

HOWTO

meta-qcom implementation

Linaro
Developer Services

Entry points

- linux-yocto_%.bbappend

```
# do not override KBRANCH and SRCREV_machine, use defaults
COMPATIBLE_MACHINE:qcom = "qcom-armv8a"
FILESEXTRAPATHS:prepend:qcom := "${THISDIR}/${PN}:"

# include all Qualcomm-specific files
SRC_URI:append:qcom = " \
    file://qcom.scc \
"
```

Configuration gets assembled from ‘`scc`’ and ‘`cfg`’ files

And you add more in your layers using this BSP!

Defer -stable tracking to linux-yocto maintainers (Thank you, Bruce!)

Entry points

- linux-yocto_6.6.bbappend

```
SRC_URI:append:qcom = " \
    file://0001-arm64-dts-qcom-disable.patch \
    file://qca6390-driver/0001-dt-bindings-mfd-qcom.patch \
    file://qca6390-driver/0002-mfd-qca639x-add-support.patch \
    file://qca6390-driver/0003-mfd-qcom-qca639x-switch.patch \
…
"
```

Now each patch MUST have ‘Upstream-Status’ trailer!

History is no longer lost when somebody switches Git branches

Config fragments

- recipes-kernel/linux/linux-yocto/qcom.scc
  - empty file, triggers inclusion of other files
- recipes-kernel/linux/linux-yocto/bsp/qcom-armv8a/qcom-armv8a.scc

```
kconf hardware qcom.cfg

include qcom-sdm845.scc
include qcom-sm8250.scc

# include standard features and config fragments
include features/i2c/i2c.scc
include features/power/arm.scc

include cfg/timer/rtc.scc
include cfg/dmaengine.scc
```

Config fragments

- recipes-kernel/linux/linux-yocto/bsp/qcom-armv8a/qcom.cfg

```
CONFIG_ARCH_QCOM=y
CONFIG_ARM_PSCI_CPUIDLE=y

# CONFIG_MOUSE_PS2 is not set
# CONFIG_KEYBOARD_ATKBD is not set
CONFIG_KEYBOARD_GPIO=y
```

- recipes-kernel/linux/linux-yocto/bsp/qcom-armv8a/qcom-sdm845.scc

```
kconf hardware qcom-rpmh.cfg
kconf hardware qcom-sdm845.cfg
```

- etc.

Downsides

- No control over the exact kernel version
- Sometimes linux-yocto kernels get delayed a bit
- Additional patches on top of the Linux release tag

- Development becomes more complicated
- Reponsibilities shift onto OE layer maintainers

- What if we have several hundred of BSP patches?

Links

- https://git.yoctoproject.org/linux-yocto/
- https://git.yoctoproject.org/yocto-kernel-cache/

- https://github.com/Linaro/meta-qcom/

- https://www.linaro.org/services/
- https://mastodon.social/@LinaroLtd
  - We are hiring!

Thank you

Linaro
Developer Services