How the Yocto Project addressed RDK scalability issues

Nicolas Dechesne, Linaro
Khem Raj, Comcast
ELCE 2019
About us

- Yocto Project Community Manager
- @Linaro
- Designed/implemented Yocto Project based RDK

- RDK architect
- OpenEmbedded and Yocto Project maintainer
- Yocto Project TSC member
Agenda

- What is the Yocto Project?
- What is the RDK?
- Scalability issues
- Yocto Project to the rescue!
- Collaboration benefits
What is the Yocto Project?
What is the Yocto Project?

The Yocto Project is a set of templates, tools and methods that help you build custom Linux-based systems.
The Yocto Project

- An open source, collaborative project
  - hosted by the Linux Foundation in 2010
  - Project architect is Richard Purdie.
  - Uses OpenEmbedded which started in 2003.

- Support all platforms:
  - ARM, x86, PPC, MIPS, RISC-V

- The de facto industry standard “tool kit” for building custom embedded Linux operating systems with
  - over 50% market share by volume
  - over 80% market share by revenue
  - Released twice a year (April and October)
Why?

- **Spend less time on things that bring no value to your business:**
  - up-to-date recipes for thousands of packages
  - Quickly build an entire Linux system from source, using a validated set of packages (toolchain, busybox, libc, init system...)
  - Built in support for package management
  - Predictable and reproducible builds

- **Provides set of standard tools and build guidelines.**
  - reuse across projects or organizations
  - autobuilders/bots
  - Helps manage adherence to Open Source Licensing
  - Minimal dependencies on host and users

- **Flexibility and customization:**
  - Configure the system at will.
What is the RDK?
RDK Video software stack
Scalability issues
RDK 1.x: why the need for change?

- Legacy RDK build system
  - started with a trivial script
  - grew into a very complex “program”
- Difficult to use,
  - lack of documentation
- Difficult to maintain and satisfy the scalability of RDK community
- Very slow upgrade of standard open source core components
  - security
  - bugs
  - improvements
RDK 1.x: the BSP problem

BSP / Vendor

RDK

MSO

gcc
Qt5
GStreamer
busybox
ssh
build system
Yocto Project to the rescue
Migration to Yocto Project: goals

- RDK unification
- Clear separation of ownership and responsibilities
- Yocto Project as a foundation for RDK
  - rely on well supported (and existing!) recipes
  - maintenance and security updates
- Simplified and consistent build infrastructure
- Upgradability
- Reduce cost of entry for new vendor and new adopters
RDK 2.x layer architecture
RDK 2.x: origin of software components

75% of the system image comes “for free” from Yocto Project component
Bonus track: the RDK Emulator
Collaboration Benefits
Yocto Project RDK benefits

• Build “on the shoulders of giants”
• Standard distribution and build tools
  • Reduce fragmentation and differentiation across SoCs in areas that don't matter
  • Reduce entry barrier for newcomers in the RDK community
  • Benefits from development, innovation and support from the entire Yocto Project ecosystem
  • Thousands of components already pre-integrated
• Standard BSP deliveries
  • Homogeneous across all RDK SoC vendors
  • BSP layer can be made independent of RDK, and can be reused for any OpenEmbedded based project
• Growing RDK community
Benefits ... RDK 3.0

- RDK has gained sharper Innovation focus
  - Westeros - Embedded Wayland Compositor
  - Spark UI [http://www.sparkui.org//index.html](http://www.sparkui.org//index.html)
  - Firebolt SDK
  - Application Development Kit for RDK: [https://firebolt.app](https://firebolt.app)
  - Optimized Embedded Browser Framework (WPE)
  - Secure Video playback
  - OpenCDM
Benefits... RDKs Horizontal Scale

- RDK Projects: https://rdkcentral.com/projects/
- RDK-V - Video Clients and gateways
- RDK-B - Broadband, edge gateways
  - DOCSIS, EPON, GPON, DSL
- RDK-C - Smart Security Cameras
- RDK for WiFi Access points
- ...
Daily Driver Benefits...

- **Reduced build times (~3x)**
  - trusted incremental builds
- **Lot of Documentation**
  - Eases Developer Onboarding
- **Open Source Community**
  - Better Chances of finding developers
- **Licensing tools**
  - Help in compliance
- **Testing Infrastructure**
  - Indirect benefits
- **Security patches**
  - Backports
Challenges?

- Learning curve
  ⇒ Adopting open source culture
- Developer workflow
  ⇒ devtool
- Yocto Project upgrade
  ⇒ Yocto Project LTS?
- Continued build time improvements
  ⇒ Hash equivalency in Yocto Project 3.0
Questions and Answers
Thank you for your attention