Embedded Software Strategy & Development

Presented By

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If Microsoft ever does applications for Linux it means I've won.

-Linus Torvalds, 1998

When software developers drive hardware design it means adaptable SoC’s have won.

-Xilinx, 2018
ZYNQ™

ZYNQ™ UltraSCALE+

XILINX VERSAL™

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How Do You Want to Do This?

fetch -> build -> GCC -> integrate -> package -> deploy

PetaLinux

fetch
build
integrate
package
deploy
Open and Public Code

- GitHub.com/Xilinx
- Nearly 100 repositories
- All of our embedded software stack
- All of our Yocto recipes
- Scripts for Vivado
- Tutorials and Examples
Staying Up-to-Date

The same for every device family!
Rebase Kernel Tree

> Merge-Tree
  >> Merges two separate branches into a single new branch going forward
  >> Lose the history of what was different between the branches

> Rebase Tree
  >> Creates a series of patches that can be applied cleanly to the HEAD node
  >> Maintain history of development in the separate development paths

> Single upstream kernel version per year
> Rebase patchsets with Vivado releases
> Rolling merge tree
Compilers and Toolchains

- AArch32 – ARMv7 – Zynq-7000
- AArch64 – ARMv8 – Zynq UltraScale+, Versal
- Cortex-R5 – ARMv7 – Zynq UltraScale+, Versal
- MicroBlaze – MMU / Linux Configuration
- MicroBlaze – Microcontroller Configuration

GCC 8 Support in 2019
Enabling Yocto

> `meta-xilinx` – BSP support for Xilinx device families

> `meta-xilinx-tools` – Yocto infrastructure to interface with Xilinx tools

> `meta-petalinux` – Infrastructure to replicate the default PetaLinux root filesystem
Integrating with Yocto

GitHub Sources

- User Configuration
- Metadata (.bb + patches)
- Machine (BSP) Configuration
- Policy Configuration

Openembedded Architecture Workflow

- Upstream Source
- Metadata/Inputs
- Build system

Output Packages
- Process steps (tasks)
- Output Image Data

Package Feeds

- Image Generation
- SDK Generation

Images

Application Development SDK

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Abstracting Yocto

DTS

sources

yocto

 compilation

GCC

export

PetaLinux

deploy
Multiprocessing with Xen

- Reducing code Size
- Working toward certifiability
- Dom0-less boot
- Automatic static partitioning
Jailhouse on Zynq UltraScale+ MPSoC

> Done by Xilinx partner ENEA

> Runs on standard SMP Linux without PREEMPT_RT

> Small and fast (<10k LoC)

> Simplifies running bare-metal code on Linux systems
OpenAMP and Interprocessor Comms

> Built on standard remoteproc and rpmsg infrastructure

> Open and public on GitHub.com/OpenAMP
FPGA Manager

$ /sys/class/fpga_manager/fpga0/
New Community Portal

> Xilinx.com/community

> Centralized Clearinghouse
  >> References other resources, doesn’t replace them

> Increasing number of developers use Open Source Content
  >> Converge content and make navigation to desired location easier

> Xilinx has lots of Open Source content to filter
  >> GitHub, AWS, Wiki, Ultra96
One more thing…
Decoupling PetaLinux Projects

- 2019.1
  - Project A
  - SW Components A

- 2019.2
  - Project A
  - SW Components A

Interchange

Decoupling Runtime Components

- 2019.x
  - rootfs
  - kernel
  - U-boot
  - FSBL
  - bitstream

- 2019.x+
  - rootfs
  - kernel
  - U-boot
  - FSBL
  - bitstream

Update

Decoupling Linux from Vivado

- 2019.X+
  - Vivado
  - DS A
  - XSC T
  - Open Format
  - PetaLinux

Decoupled from Vivado

- 2018.3
  - Vivado
  - DS A
  - TCL
  - PetaLinux

Tightly coupled with Vivado

Decoupling Packages from Each Other

Package Update

Package Repo