Virtual Platforms for early Embedded Software Development

RISC-V 8th Workshop – Barcelona
Wednesday May 09, 4:00pm

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Hugh O‘Keeffe – Ashling
New Markets With New Software Requirements

- Schedule
- Quality
- Reliability
- Security
- Safety
- Engineering productivity / automation
- Predictability on software development schedules
- Unknown / unmeasurable software delivery risk
Virtual Platforms Accelerate Software Development

- A key to the adoption of RISC-V is Software
  - Need processors/platforms for software development
  - Start porting existing software to RISC-V

- Virtual platforms (software simulation)
  - Available months before hardware
  - Can be used in hardware verification
  - Can accelerate software porting and development
  - Can help bring up of software on new platforms
  - Support of RISC-V instruction extensions
Processor Platform Configurations

Single core, simple

Multi-core shared memory

Many-cores

Heterogeneous

Booting OS, eg Linux
Extendable Platform Kits™ (EPKs™)

- EPKs are virtual platforms
  - with software set-up, help users to start quickly
- EPKs include
  - Individual models, binary and source
  - Platform model, binary and source
  - Software and/or OS running on platform

- 200+ Processor Models
- 50+ EPKs
- 100s of peripheral models available in the OVP Library
- All models are open source
  - Distributed under the Apache 2.0 open source license
- All models have both C and SystemC interfaces

- Peripherals: users define pins and registers, and functionality
- Platforms: users define memory, component connectivity
RISC-V EPK based on SiFive U54-MC

The Virtual Platform Provides a Simulation Environment Such That the Software Does Not Know That It Is Not Running On Hardware

Under 10 seconds to get to booted Linux login prompt!

https://www.sifive.com
RISC-V EPK based on Andes N25 (RV32IMAC)

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RISC-V EPK Custom Extensions

- Easy description of Custom Instruction extensions
- No disruption to existing underlying verified model

- ChaCha20 cipher as example of custom instructions for algorithm accelerators
- Instruction Extensions to RISC-V courtesy of Cerberus Security Laboratories Ltd
- https://cerberus-laboratories.com
RISC-V EPK Missing Custom Extensions (FU540)

Virtual Platform Console

Linux Console
RISC-V EPK Implemented Custom Extensions (FU540)

Virtual Platform Console

Linux Console
Software Development using Ashling RISC-V IDE

- Ashling RISC-V IDE Integrates with Imperas Virtual Platforms/Processor Models
- IDE supports full software development cycle including edit, build, debug, test and verification on the actual Virtual Platform or Processor Model all from a user-friendly Eclipse based IDE environment
Software Development using Ashling RISC-V IDE cont’d

- The same software toolchain/IDE can be used throughout the complete design cycle….from simulation using the Imperas models to device/board bring-up with actual silicon
- Includes latest RISC-V compilers including GCC and LLVM
Imperas & Ashling solutions

Methodology
Collaboration with customers, vendor ecosystem

Models
200+ CPU models
200+ peripheral models
50+ EPK (Extendable Platform Kits)

Tools
Leading simulation, debug, software verification tools

Resources
Imperas and partners
Model development
Tool development

Training
Imperas and partners
On-site, customized agenda
Virtual Platforms Accelerate Software Development

- Risk-free addition of custom instruction extensions without disrupting model quality
- Complete the virtual prototype before silicon or even RTL is available
- Accelerate software development and porting of existing software
- Use EPK for
  - Ecosystem partners
  - Early application development
  - Lead customers
Contact

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