Making Microchip PolarFire SoC platform available to everyone today with Renode

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Develop your IoT product with Renode™:

GET STARTED
Renode in short

- rapid development framework for building software including real, end-user applications
- open source Instruction Set Simulator (ISS) with a multi-layered framework on top
Renode – why?

• system emulator - mimic entire boards or even multiple connected nodes
• scriptable, API-oriented, extremely flexible
• software agnostic - runs Zephyr, Linux, bare metal, proprietary SW: binary compatible (no special compilation targets)
**Renode – applications**

- pre- but also post-silicon, building really test-driven systems
- HW-SW co-development - reduce design cycle, experiment, prototype, get real feedback
- used anywhere where you’re expecting complex software especially developed by multiple parties
- IoT, smart office, energy, lighting, defense, security, automotive...
Enabling the Freedom to Innovate: PolarFire SoC FPGA architecture
PolarFire SoC FPGA architecture

**Deterministic, Coherent CPU Cluster**
- 128K Boot Flash
- Secure Boot
- RV64IMAC Monitor Core
- RV64GC Quad Core
- Deterministic L2 Memory Subsystem
  - DDR4/LPDDR4 Controller
  - DDRIO PHY
- Coherent Switch
- AMBA Switch with Memory Protection and QoS
- Low Power PolarFire™ FPGA Architecture
- Performance / Event Counters
  - Instruction Trace
  - AXI Bus Monitors
  - 50 Break Points
  - Fabric Logic Monitor
  - SmartDebug
  - Debug Locks
- IO
Before – a USD 3000 development platform (hard to fit in carry-on luggage)
Now - Renode, a free and open source framework that’s in your PC (or server)

Get Renode™ for:

- **Debian**
  - Linux, (.deb)
  - Download

- **Fedora**
  - Linux, (.rpm)
  - Download

- **Arch**
  - Linux, (.pkg.tar.xz)
  - Download

- **macOS**
  - Download

- **Windows**
  - Download
PFSoc support

• Entire SoC complex
• include lots of I/O like USB, PCIe, CAN, I2C, SPI, GPIO...
• can model additional peripherals in the FPGA - easy to add new models as blocks
• working on Verilator support to actually co-simulate the IPs
• use virtual PFSoc in multiple contexts
Layer #1: System-on-Chip

CPU
- U54 RV64GC Core
- ES1 RV64IMAC Core

CAN
Ethernet
RAM
I2C
UART
SPI
USB
PCIe
Flash
Layer #2: The device
Layer #3: Complex system

- Sensor nodes
- Gateway
Easy to develop for

- lots of useful abstraction and interfaces
- human readable, modular and extensible platform description format
- plug-and-play blocks, Python stubs
PFSoC support highlights

- interfaces for multi-node connectivity
- also host-guest networking for Eth
- analyze protocols, debug entire system at the same time
PFSoc support highlights

• interfaces for interfacing with interesting external elements
• enable to really explore the flexibility of Renode
PFSoC support highlights

- interfaces for connecting e.g. sensors and actuators
- quite useful for building real boards that interact with the external world
It Works!

Temperature: 37.000
SoftConsole integration

• Standard IDE, comes bundled
• Linux and Windows
• examine the entire system as you’re developing code
• new and exciting abilities
SoftConsole integration

• Renode is extremely extendible
• Debug, tracing, visualisation - we have all the data
Collaboration features

- take your work everywhere
- send your setup to your colleague
- share it in a repository
- save/load entire system state in a problematic state - all using one file
- record/replay events to simplify recreation of buggy setups
HW/SW co-development

- Renode enables pre-silicon SW development for everyone - Microchip and their customers
- gather feedback on real needs, see real first applications before chips are taped out
- drive hardware with software
HW/SW co-development: Dover Microsystems

- Dover is developing CoreGuard™ cybersecurity silicon IP, recently endorsed by NXP
- Renode extended by Antmicro for Dover with more fine-grained control over execution and debugging
- Renode used both for Dover’s internal development as well as a demonstration and evaluation platform for their customers
Continuous Integration based development

Company Environment

Local PC

Interactive test and debug in Renode

Get help from colleagues

Commit code

Develop with favorite IDE/compiler

Tests pass?

Push to server

CI e.g. with Robot + Renode

Tests with various configurations

Merge changes

Plan tests / deployment

Renode - a new approach to complex embedded systems development
Test-first SW development:
TensorFlow Lite on RISC-V
TensorFlow Lite case

• Google adopts a Test-Driven Development approach building support for new platforms in TensorFlow Lite
• we helped them with testing an ARM platform in Renode initially
• now getting new, RISC-V platforms in: simulation/testing in Renode first!
What next?

• come talk about your software strategy with us, let us help build the tools you need
• meet us in booth 307
• join our keynote tomorrow at 9:40 – “Accelerating Innovation: why Google’s TPU was just the start”
Grab the Renode 1.6 release with PolarFire SoC and lots more!
A sneak peek into the future