Linaro connect
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OpenOCD support for AArch64 targets

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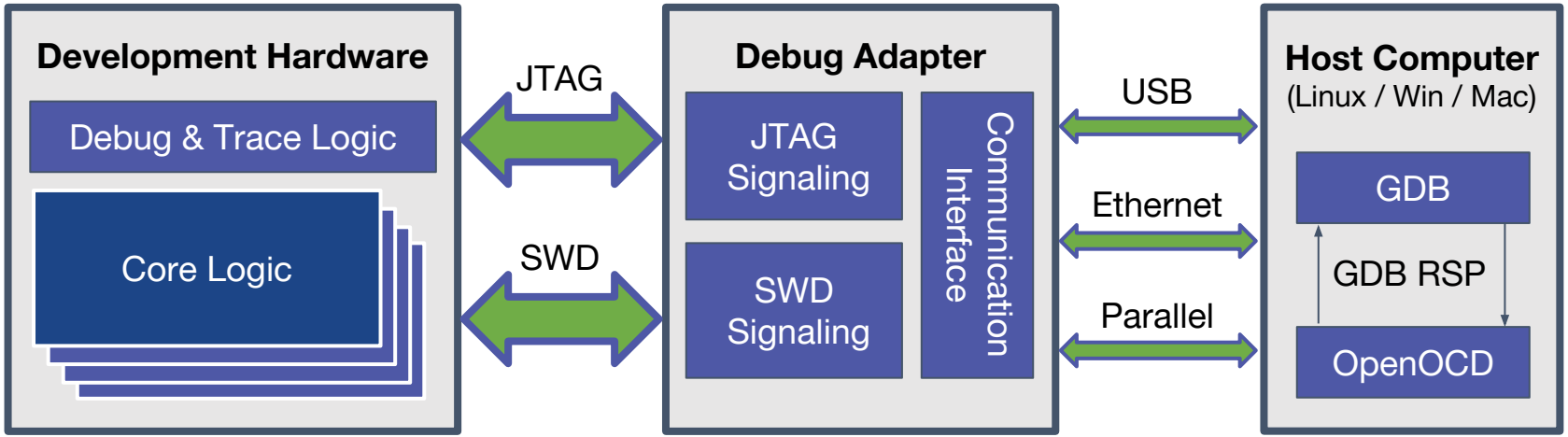
Introduction

- An introduction of JTAG/SWD based hardware debugging
- An introduction of OpenOCD and its architecture
- What Linaro has been doing with OpenOCD
- Work in progress and future plans

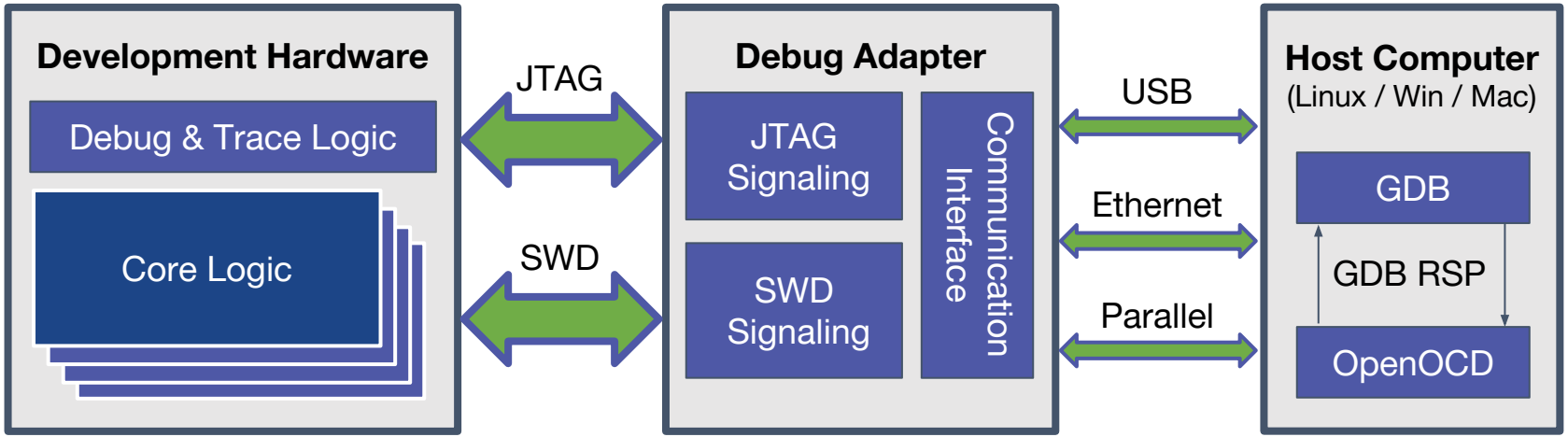
JTAG/SWD Debugging - Introduction

- Development Hardware
  - Runs software to be debugged - Firmware, Bootloaders, Kernel, User apps etc.
  - Provides a hardware debugging interface like JTAG or SWD
  - JTAG/SWD interface allows use of run-control and other debug facilities provided by the core.



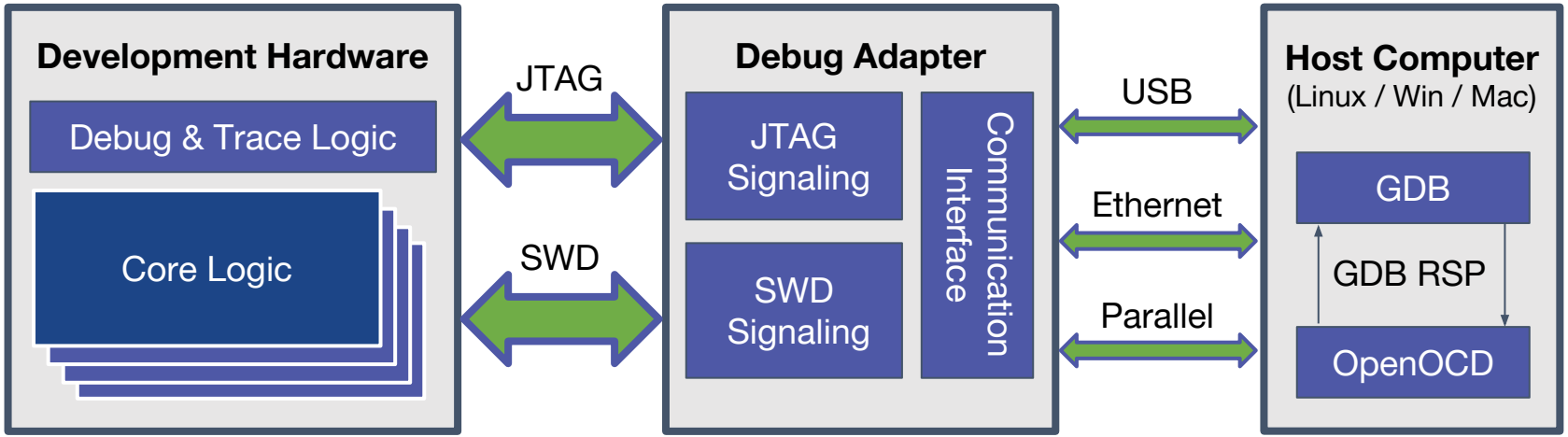
JTAG/SWD Debugging - Introduction (cont…)

- Debug Adapter or Probe
  - Communicates with hardware board by using JTAG/SWD signaling
  - Communicates with host computer using USB, Ethernet etc
  - May host a on-board JTAG/SWD driver and a gdb stub



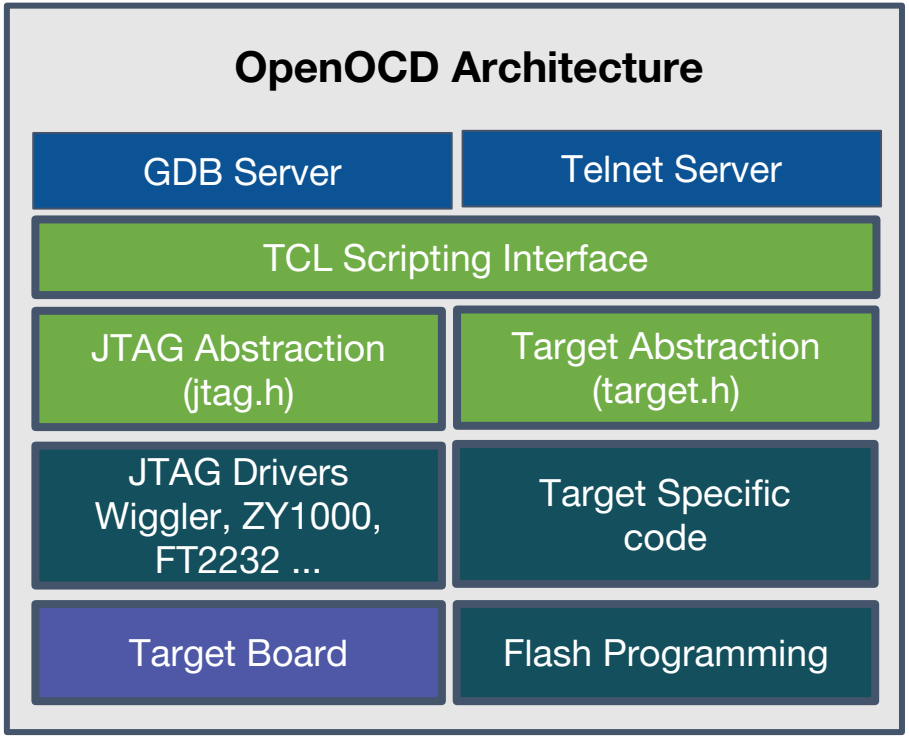
JTAG/SWD Debugging - Introduction (cont…)

- Host Computer - Runs debug tools like GDB
  - GDB communicates with debug adapter directly over ethernet using RSP protocol or using OpenOCD
- OpenOCD - Interface between debug adapter and GDB



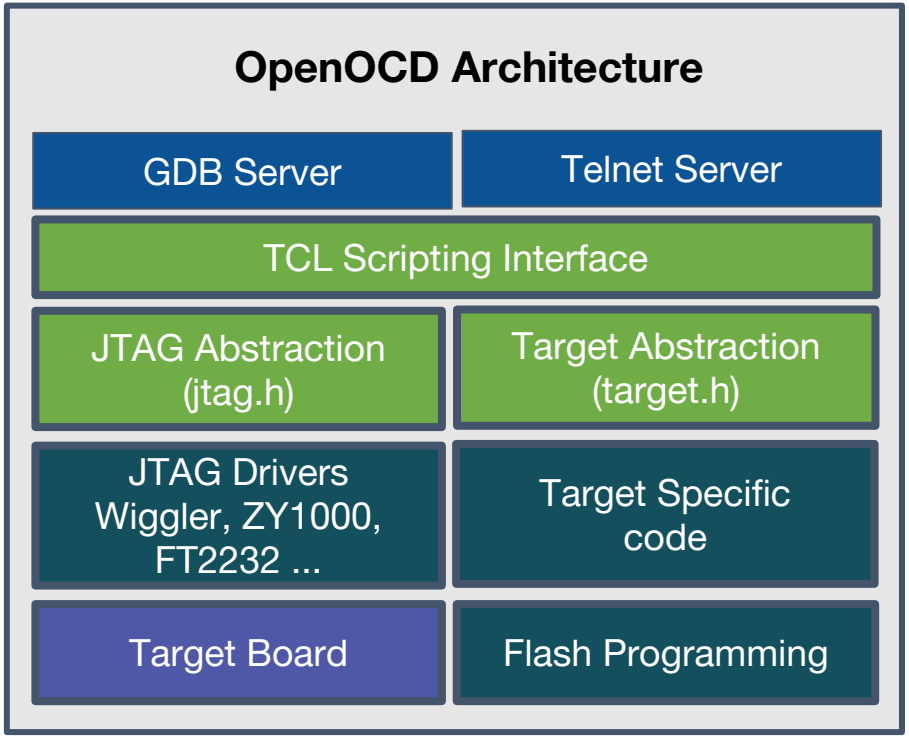
OpenOCD Architecture - Introduction

- User Interface
  - GDB connected OpenOCD GDB stub
  - Telnet client
- Target Interface
  - Debug probes via drivers or libraries
- Target Management
  - Halt/Resume, Step, Break etc
  - Memory and Register access
  - Cache and MMU management
  - Flash Programming
  - JTAG/SWD configuration



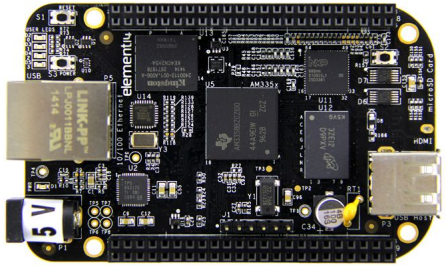
OpenOCD Architecture - Introduction (cont…)

- TCL Scripting Interface
  - Describe new targets variant boards
  - Describe new debug interfaces
  - Perform scripted initialization
  - Event based command operation
  - Accessible via GDB monitor commands



Linaro's OpenOCD Efforts

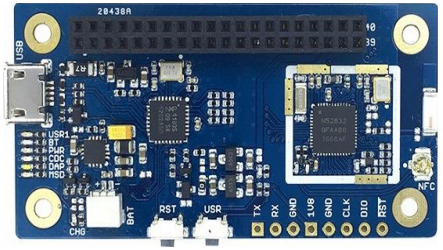
- Architecture Specific
  - Verify Arm v7-a support
  - Verify Arm v8-a support
  - Verify Arm v7-m support
  - Compare Arm v7-a and Arm v8-a
- Board specific
  - Verify Hikey 96 Board
  - Verify Nitrogen 96 Board
- GDB Integration
  - GDB testsuite using OpenOCD stub
  - GDB testsuite results comparison
    - Arm v7-a vs Arm v8-a (AArch64 Mode)
    - Arm v7-a vs Arm v8-a (AArch32 Mode)



Beaglebone Black

HiKey 96 Board

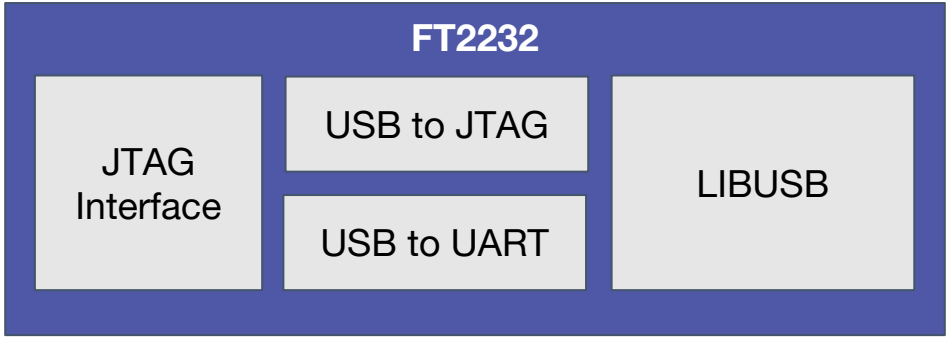
Raspberry Pi 3

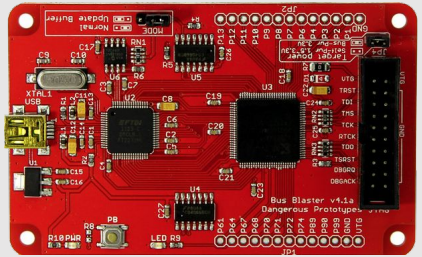


Nitrogen 96 Board

Linaro's OpenOCD Efforts (cont...)

- Hardware Configurations
  - AArch64:
    - Bus Blaster v4 + Hikey Board
  - AArch32
    - Bus Blaster v4 + Raspberry Pi 3
  - Arm v7-A (Cortex A)
    - Flyswatter2 + BeagleBone Black
  - CMSIS-DAP
    - Nitrogen Board

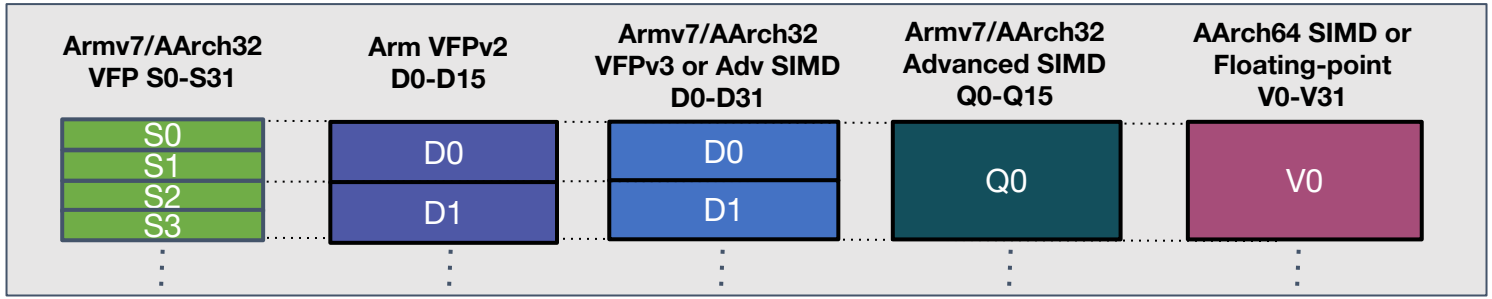



Bus Blaster V4


Flyswatter2

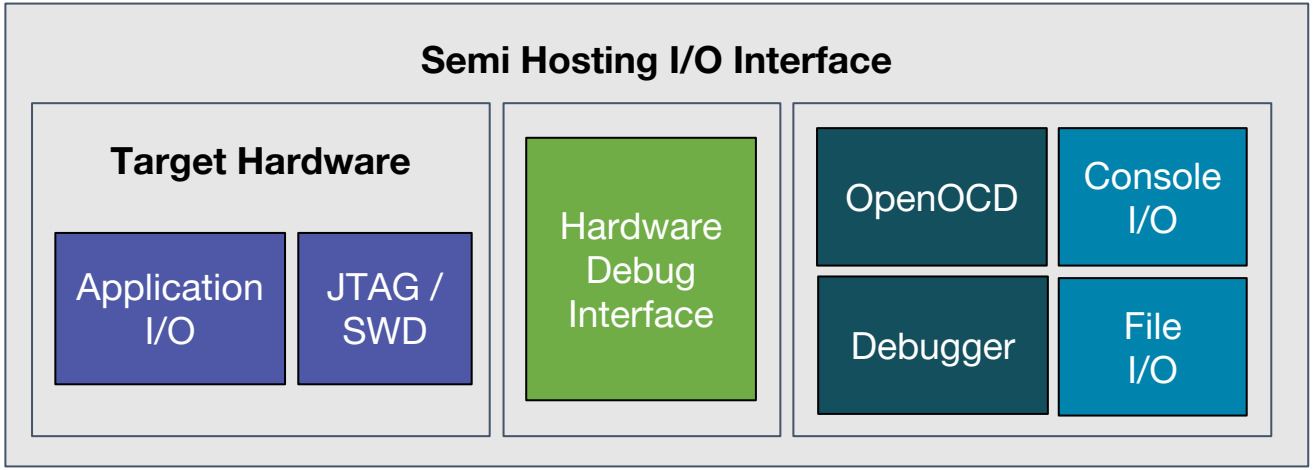
Linaro's OpenOCD Efforts (cont…)

- Upstream Contributions
  - OpenOCD Generic
    - Fix load + run failure bug in GDB
    - Make OpenOCD generate target xml with architecture defined data types
  - Arm v8-A
    - Read/Write of AArch64 SIMD-Floating-point registers
    - Read/Write of AArch32 SIMD-Floating-point registers
  - Arm v7-A
    - Read/Write of VFP v3 Neon SIMD-Floating-point registers



Linaro's OpenOCD Efforts (cont…)

- In-Progress Contributions
  - OpenOCD Arm and AArch64 Semihosting
    - Verify Arm semihosting support with NewLib plus OpenOCD
    - Add support for AArch64 semihosting in OpenOCD
    - Fix Bugs in Arm support



Future Wish List

- Arm v8-M support
- LLDB and OpenOCD
- Improvements in OpenOCD GDB stub
- Fix bugs and improve stability
- Improve OpenOCD testing

Thank You

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