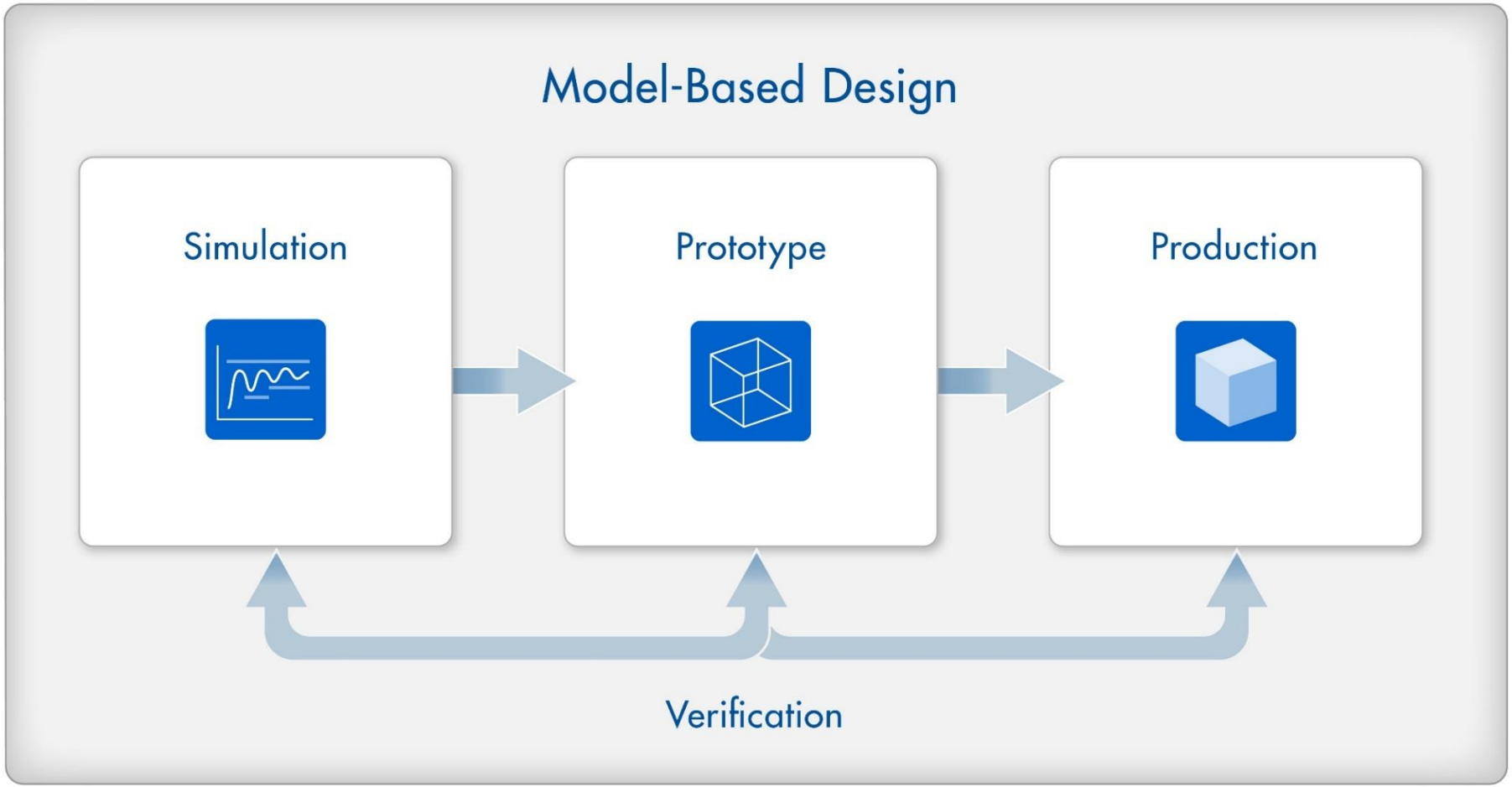
Algorithm Development Using Model-Based Design

Eric Cigan
MathWorks

Model-Based Design

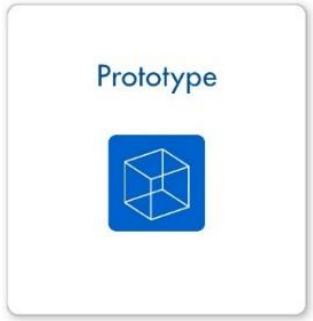
A single shared development environment



Model-Based Design

A single shared development environment

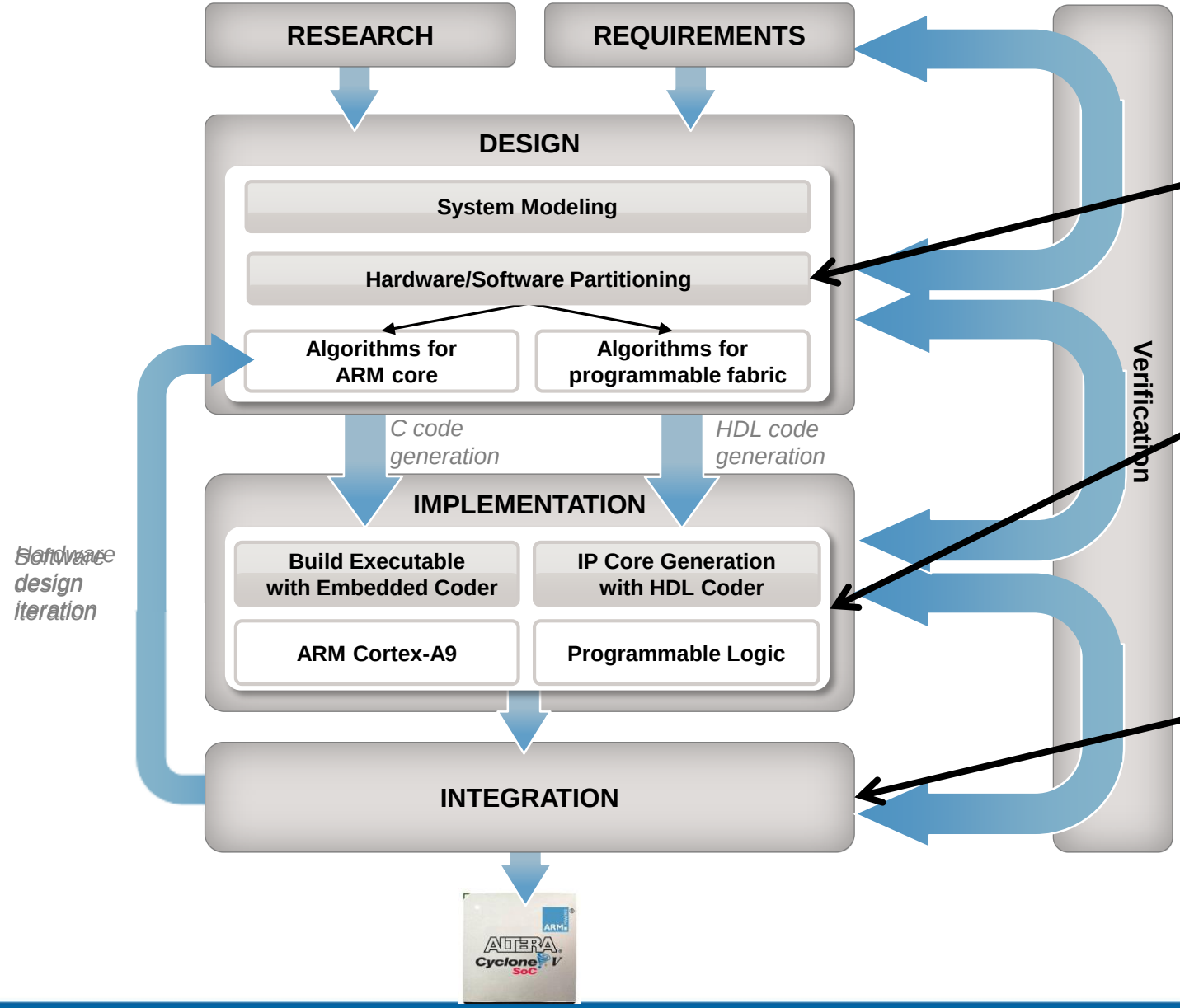
Verify operation before committing to hardware



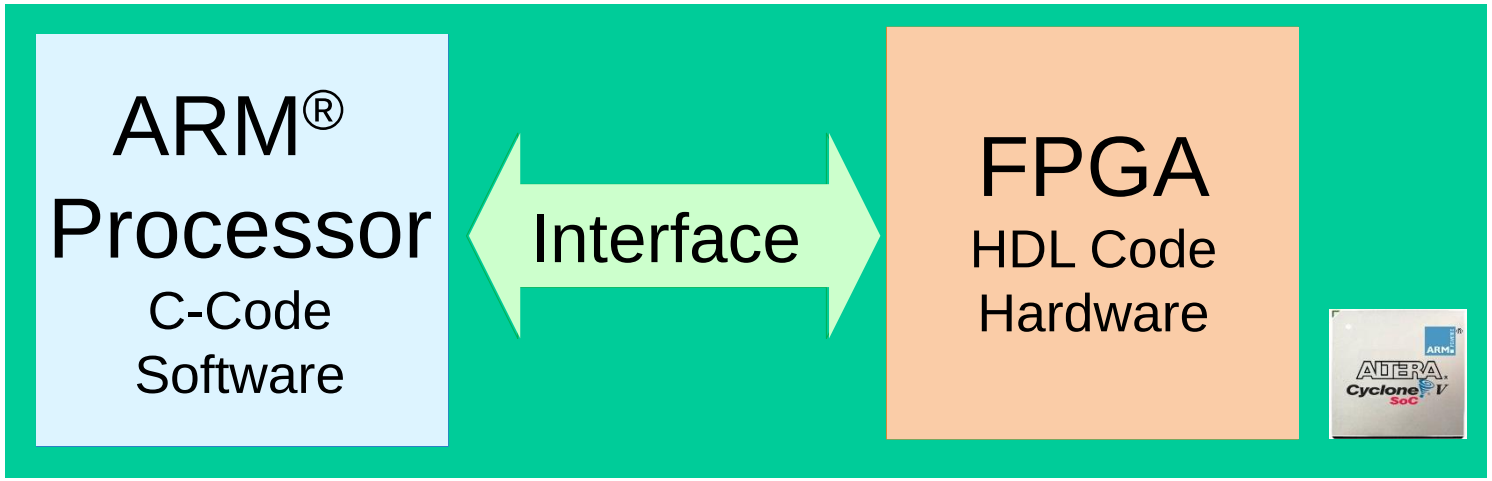
Validate performance on chip

Deploy design on target system

Model-Based Design Workflow for Altera SoCs



SoC Design Challenge



SoC Design Challenge

ARM® Processor
C-Code Software

- Typically programmed in C
- Often runs a Linux operating system
- Well-established workflows exist

CHALLENGES

- FPGA Designers not familiar with programming processors
- What should run on the processor vs. the FPGA?

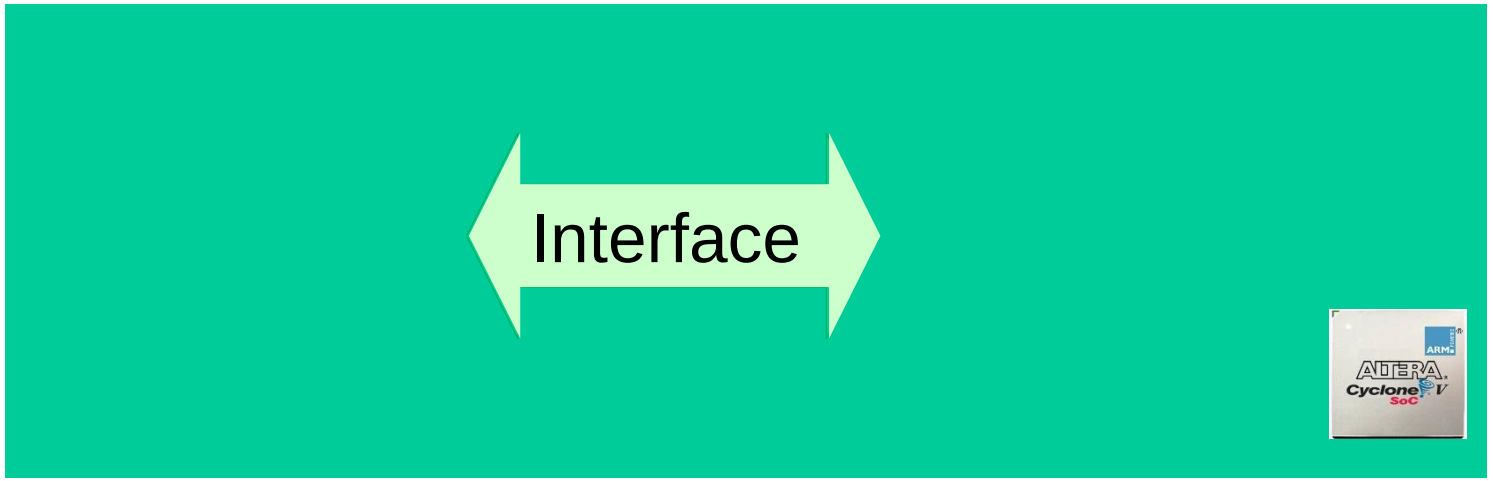
SoC Design Challenge

- Typically programmed in VHDL/Verilog
- Established workflows exist

CHALLENGES

- DSP/Processor programmers not familiar with FPGA Design
- What should run on the FPGA vs. the processor?

SoC Design Challenge

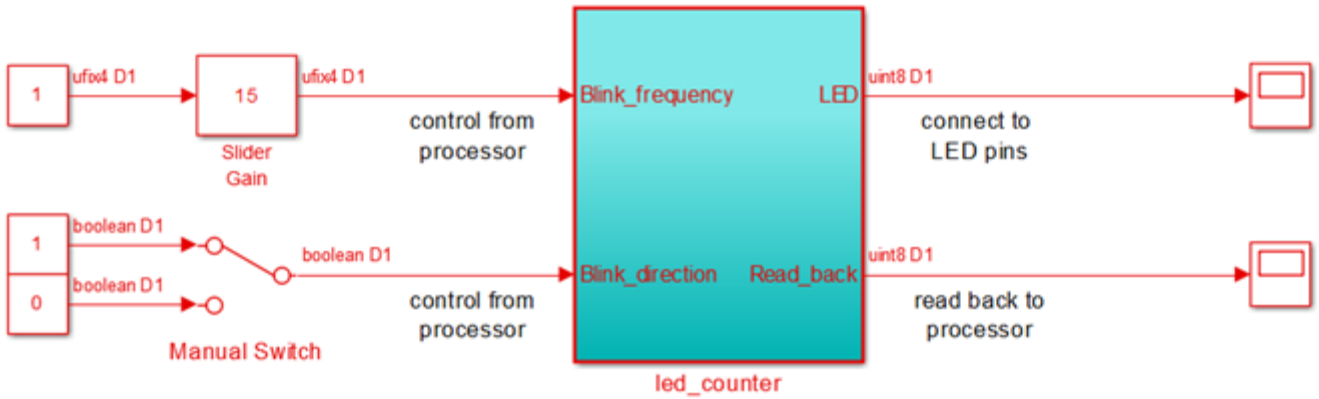


- Altera SoCs use “standard” AXI interface between FPGA and ARM

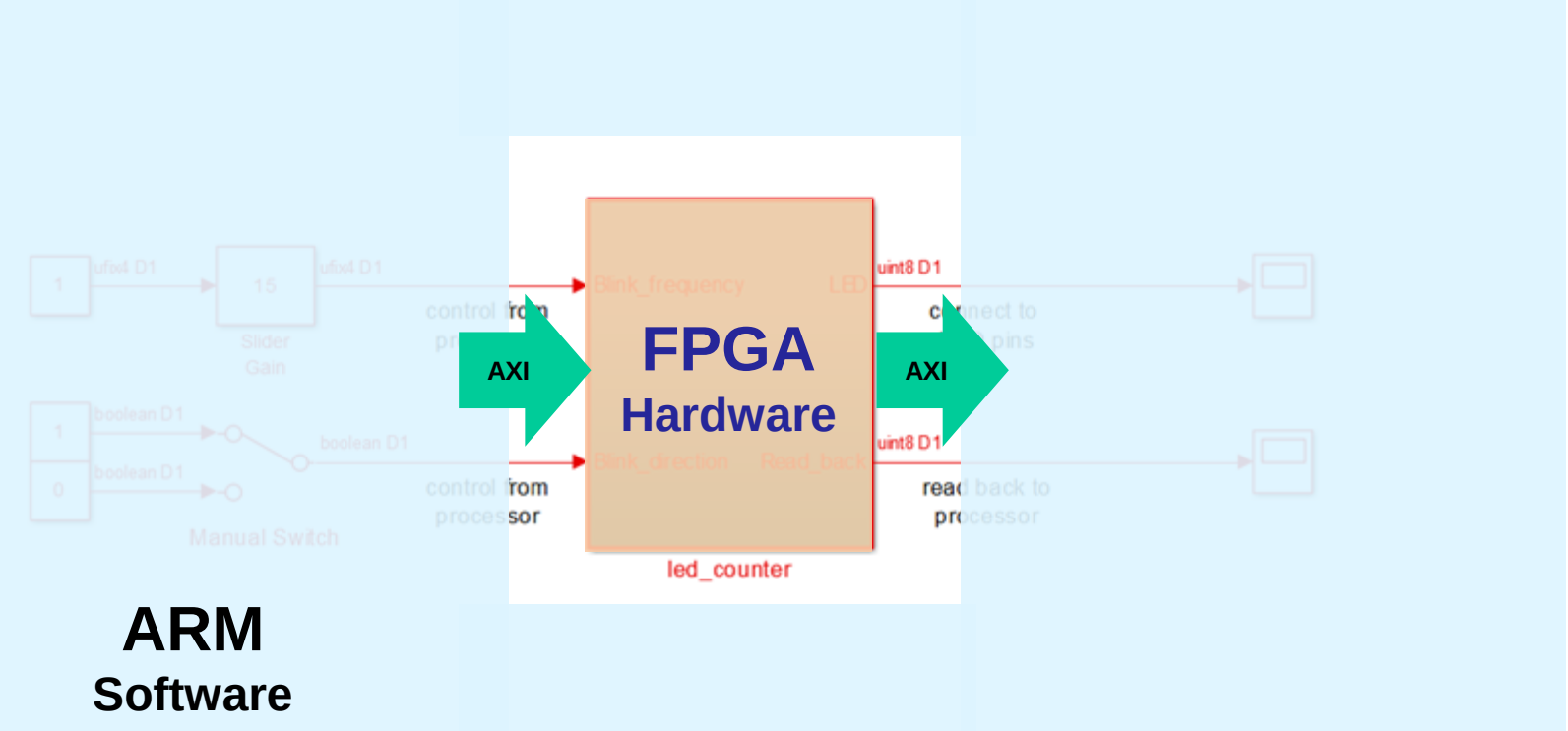
CHALLENGES

- No established rules for hooking up the interface
- Many different “flavors” of AXI for different bandwidth requirements

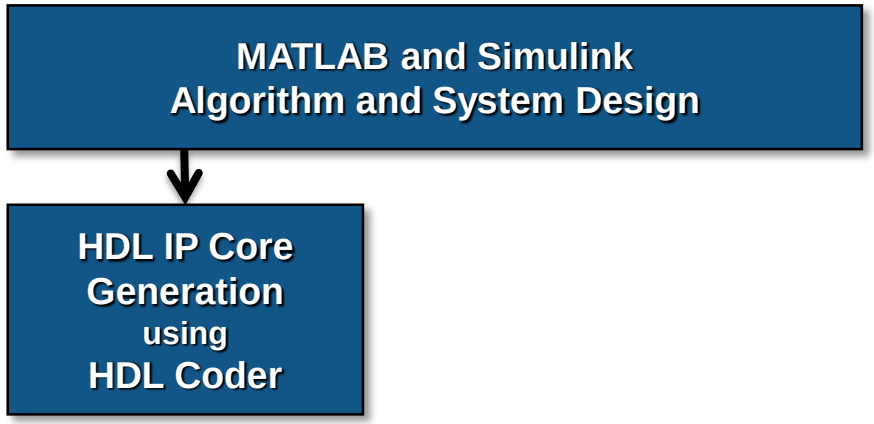
SoC Model-Based Design Workflow

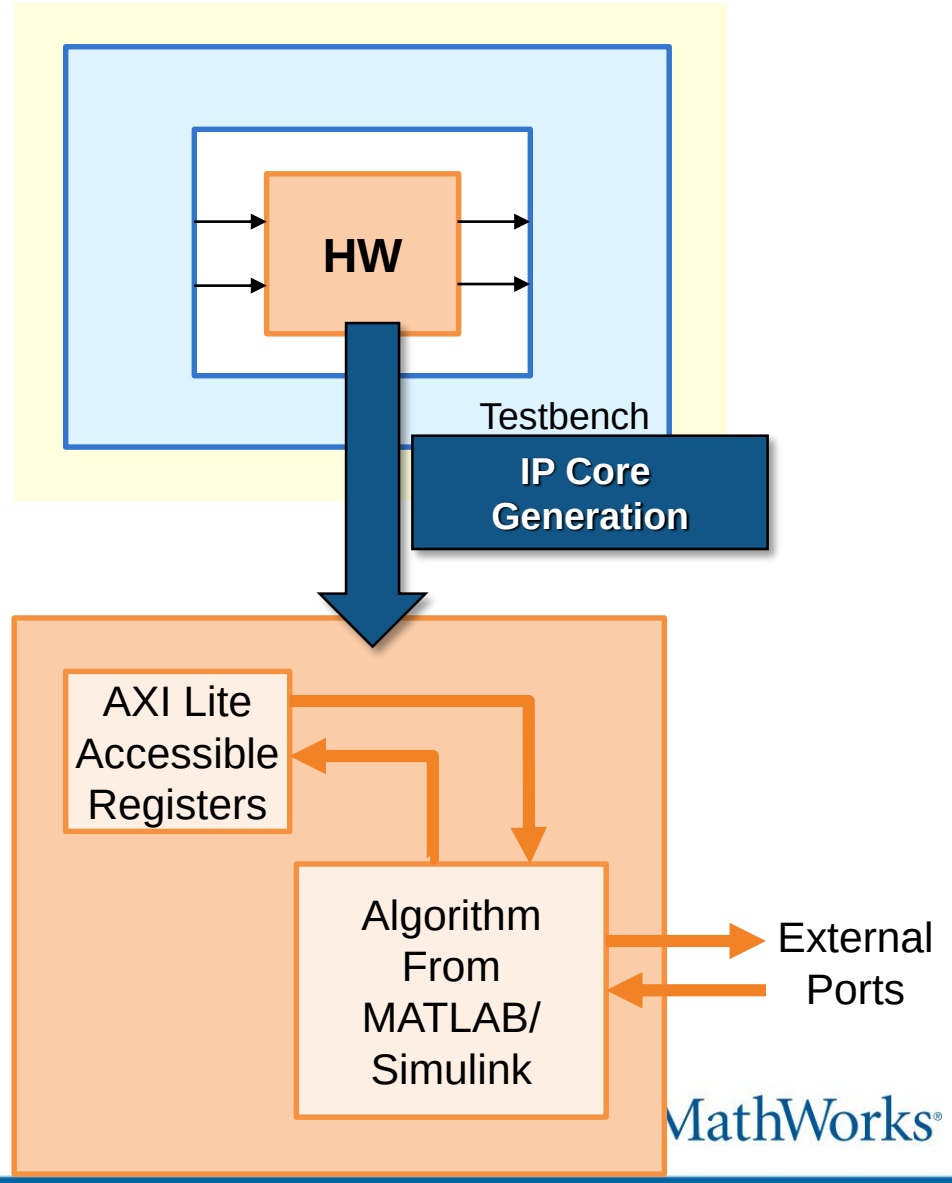


SoC Model-Based Design Workflow



IP Core Workflow





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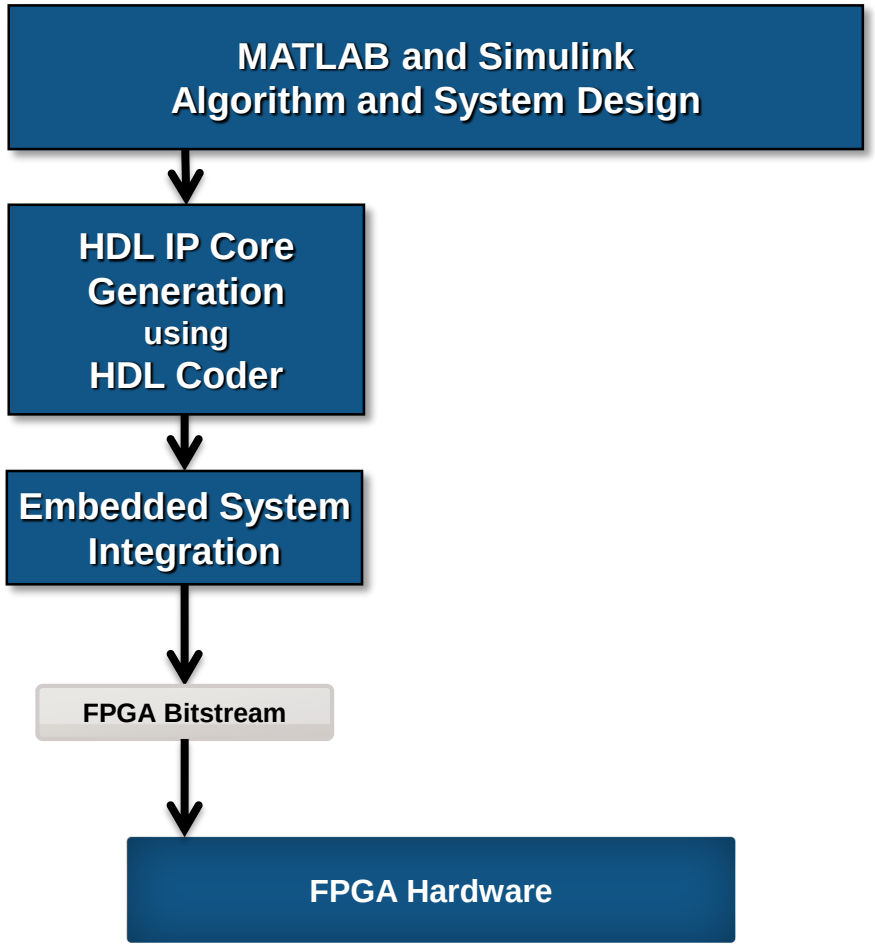
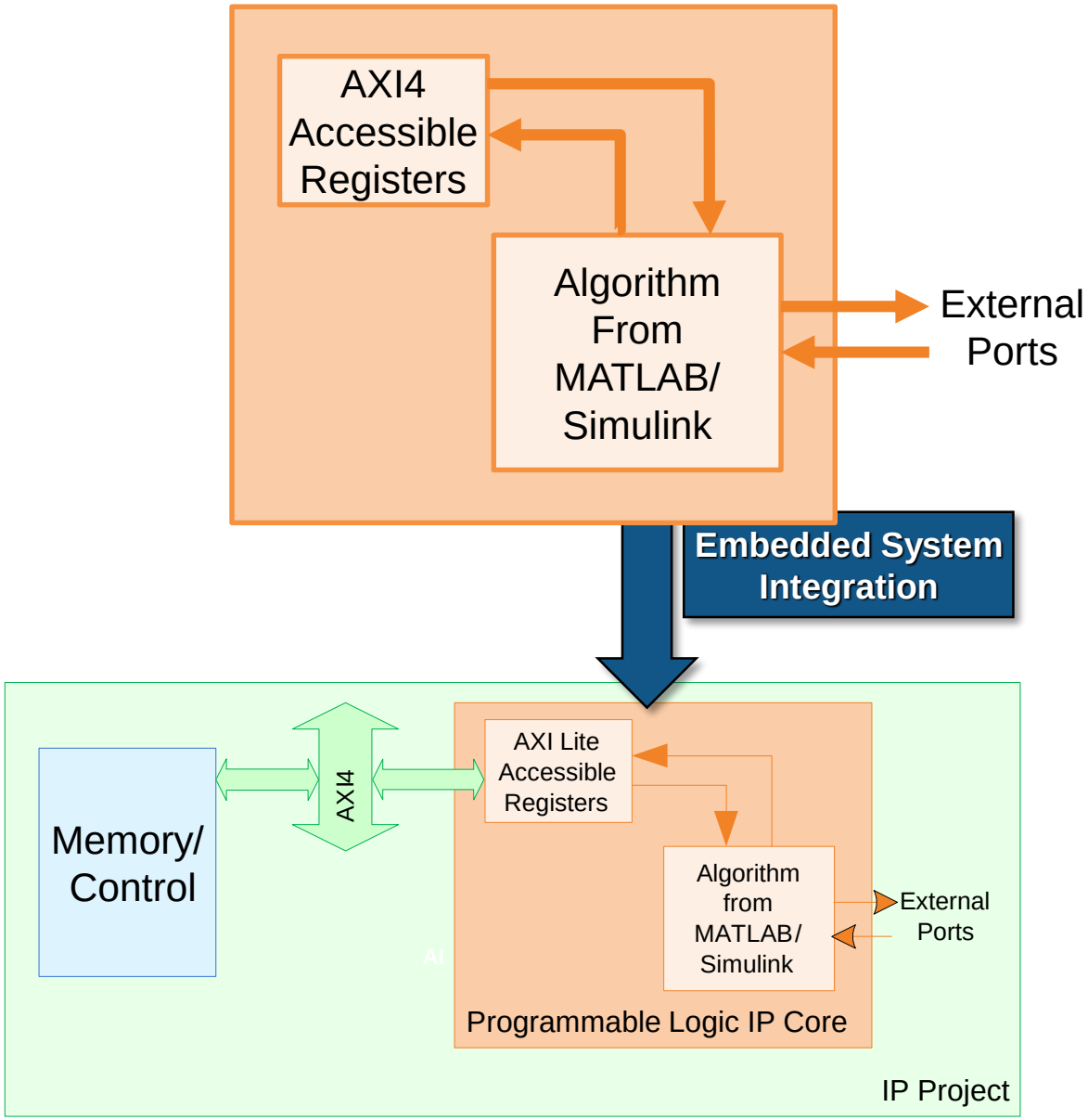
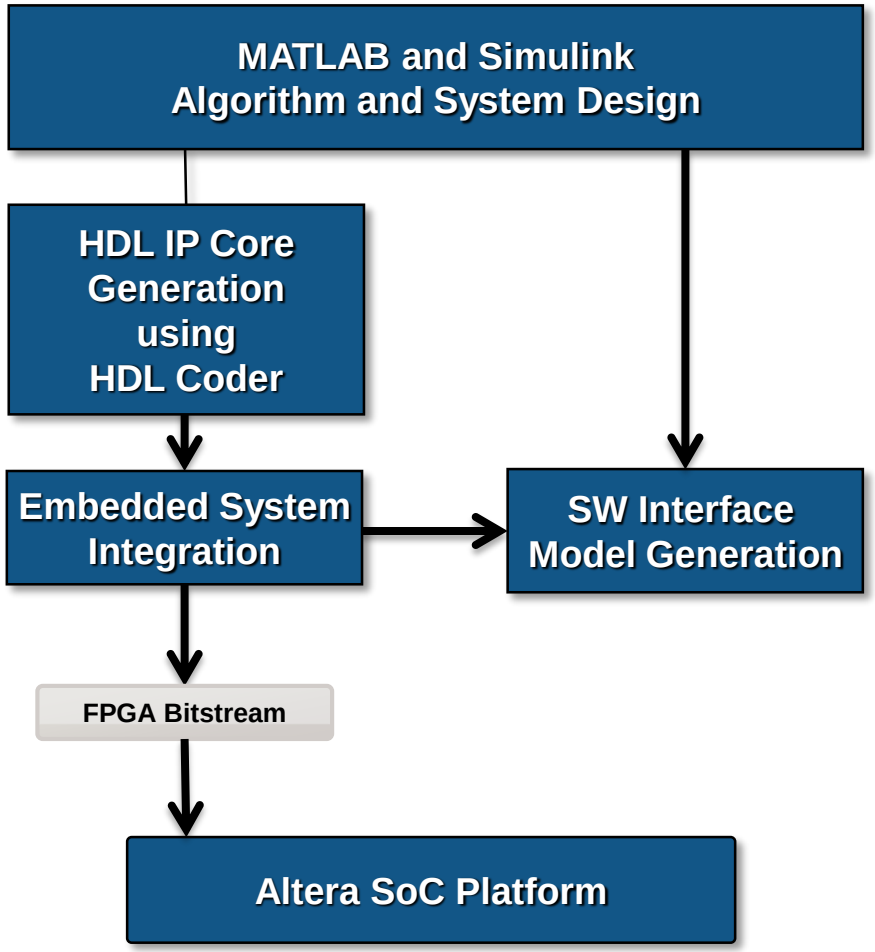
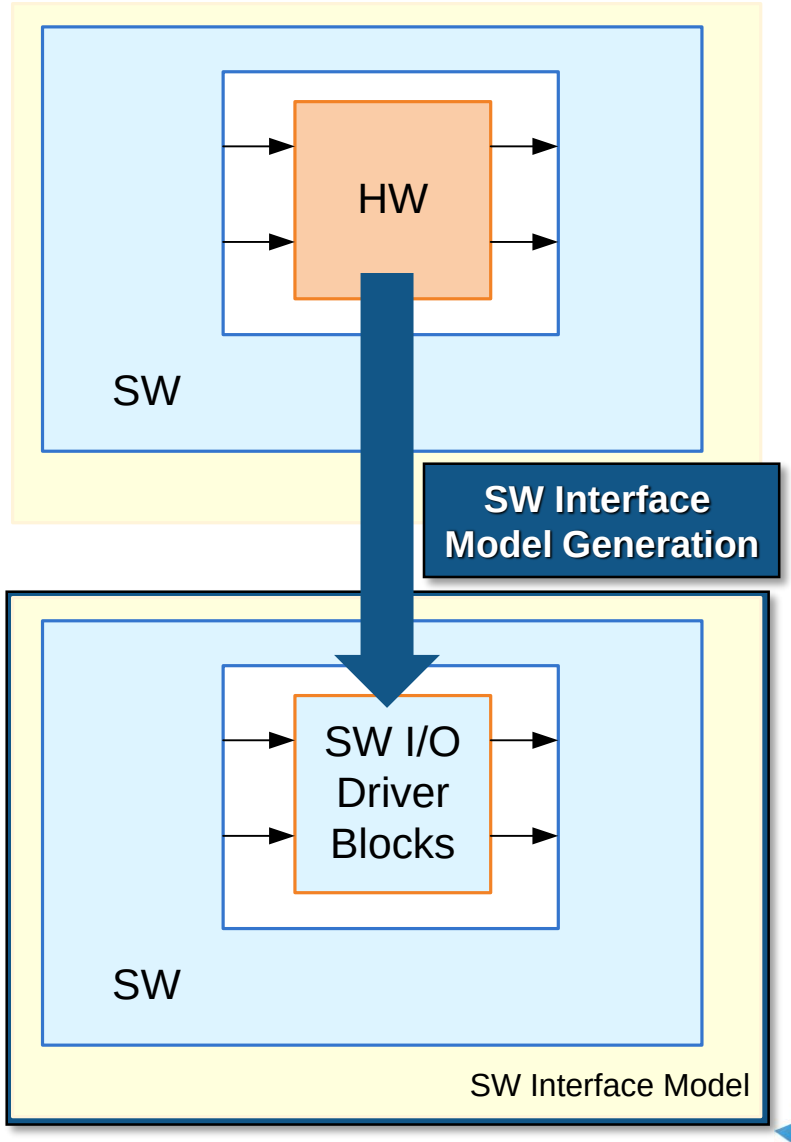


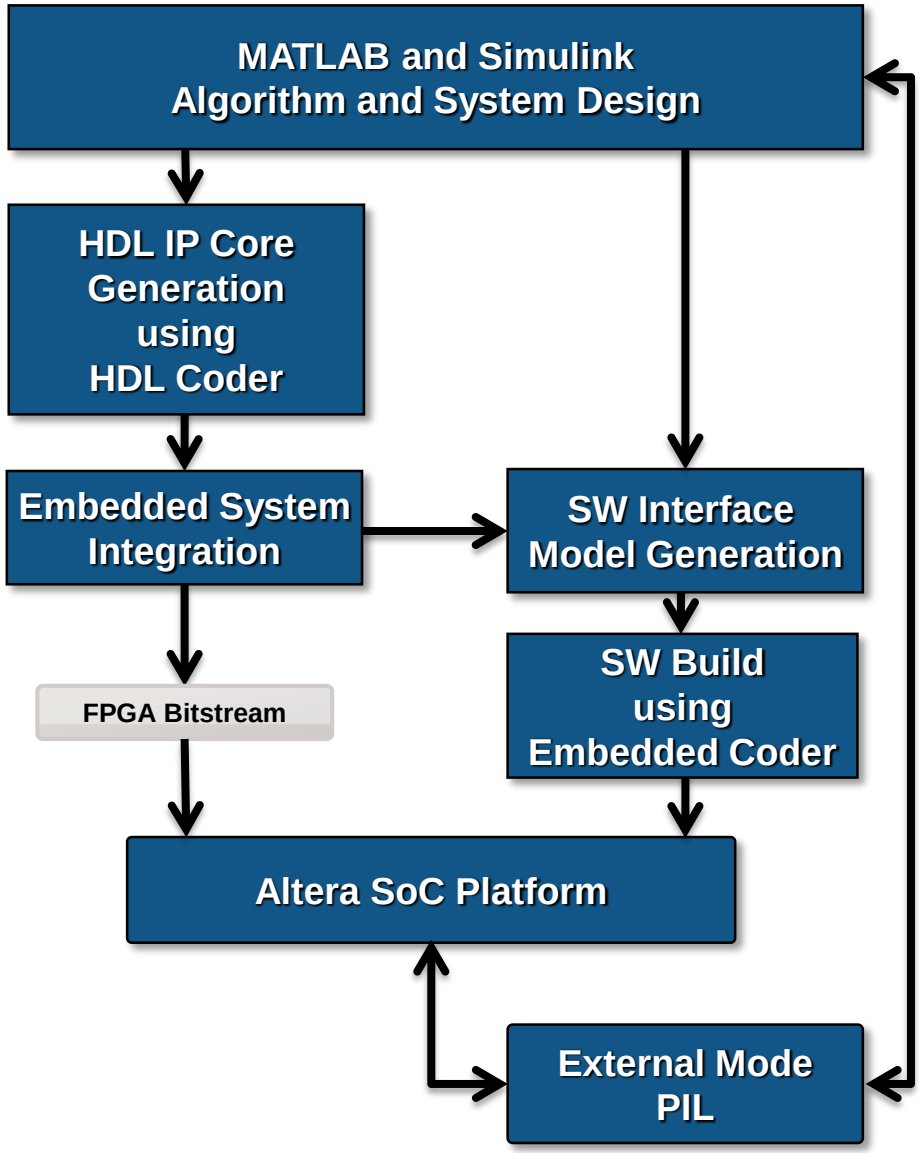


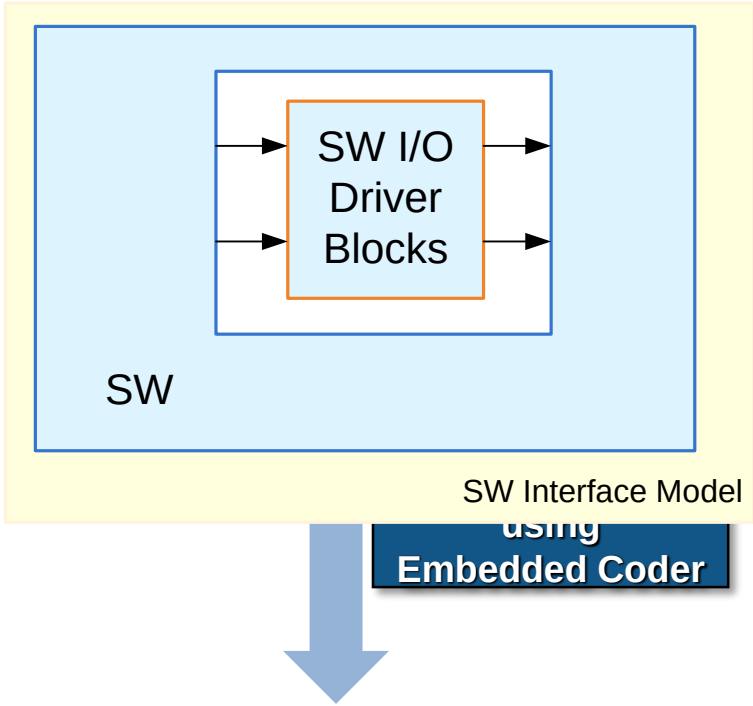
SoC Model-Based Design Workflow





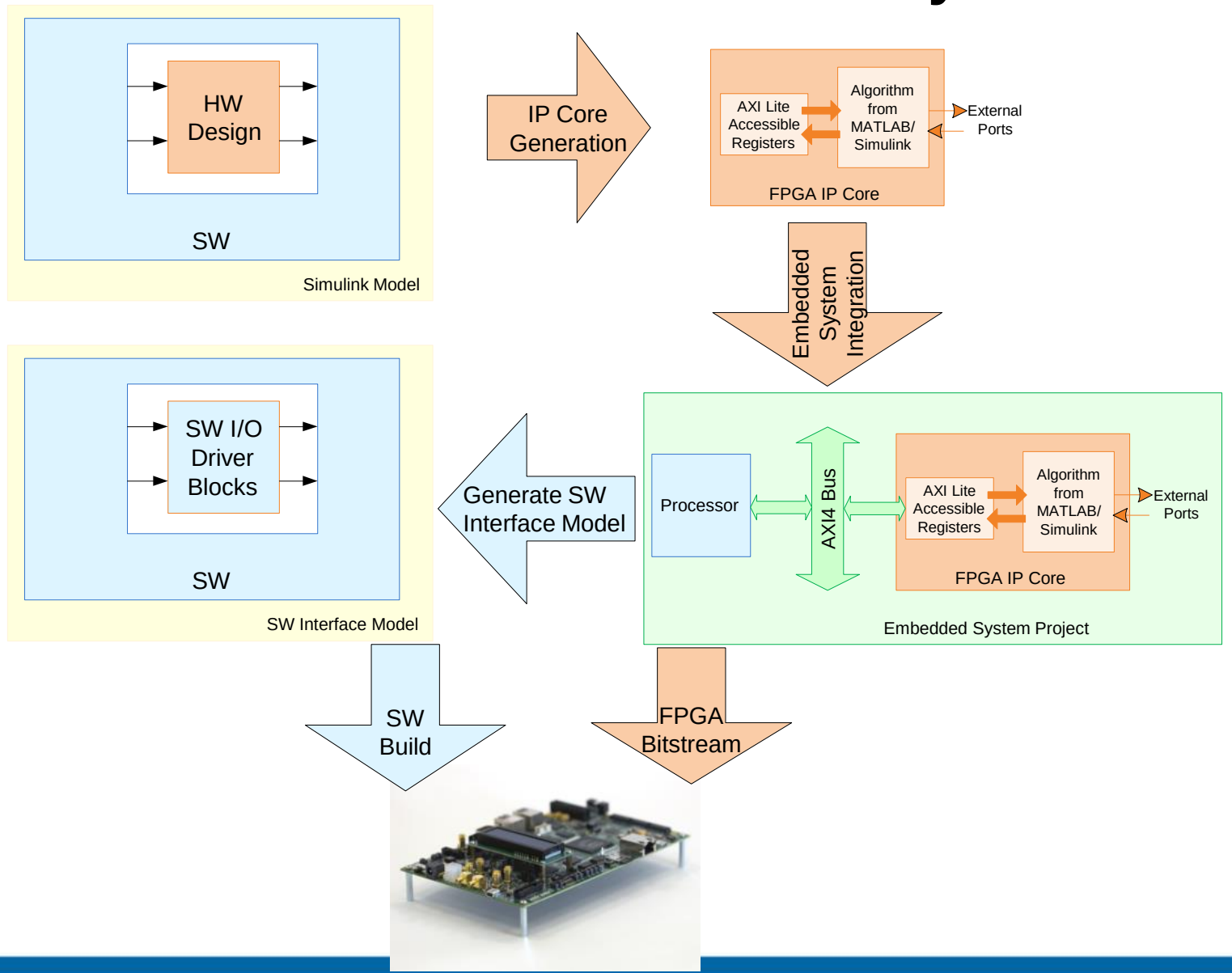
SoC Model-Based Design Workflow





- Real-time Parameter Tuning and Verification
  - External Mode
  - Processor-in-the-loop

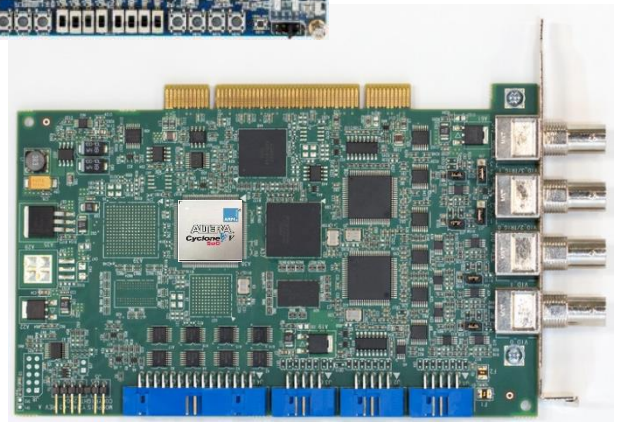
SoC Hardware/Software Workflow Summary



Target Platforms Supported with Model-Based Design for Altera SoCs

Altera Cyclone V SoC Development Kit

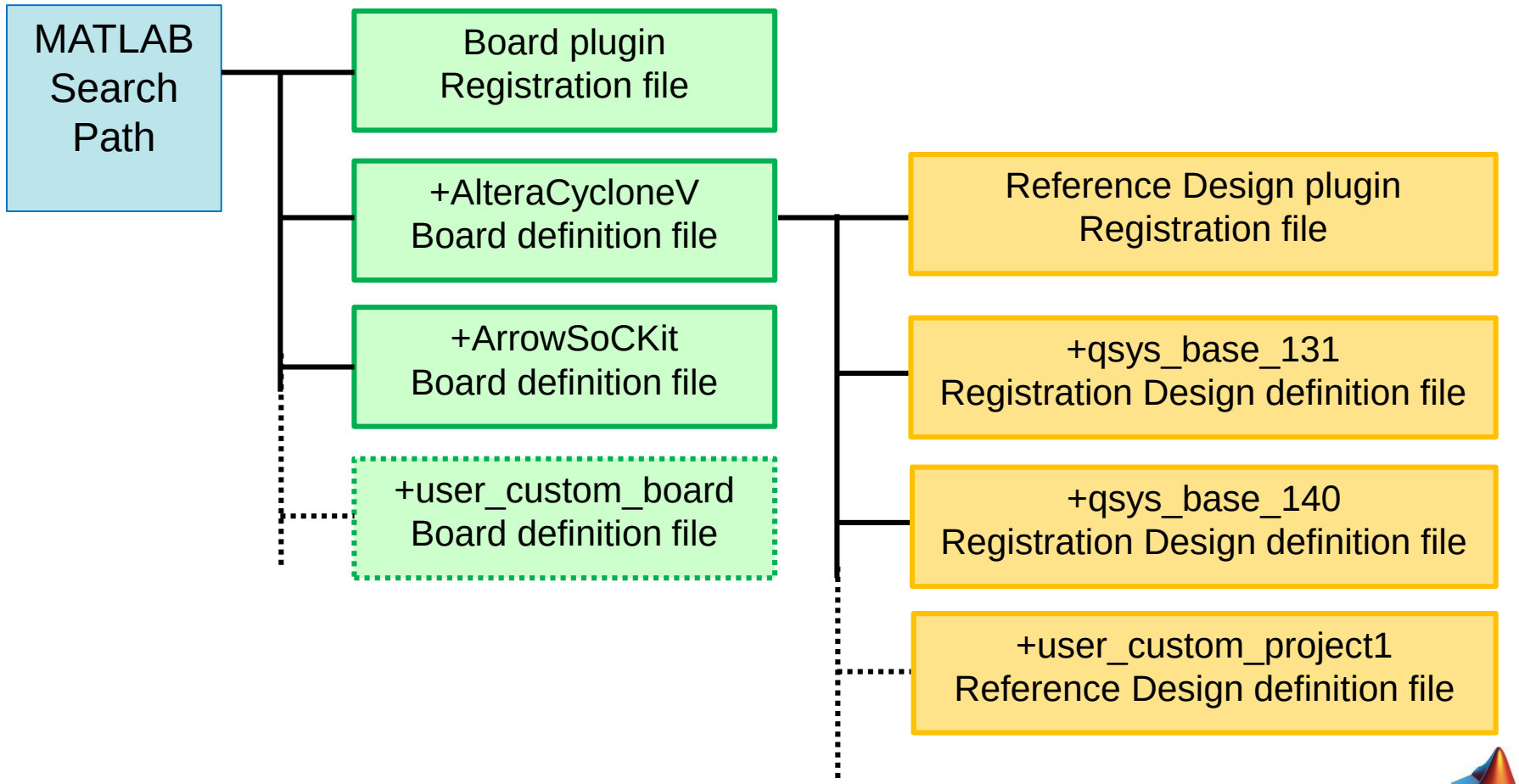
Arrow SoCKit



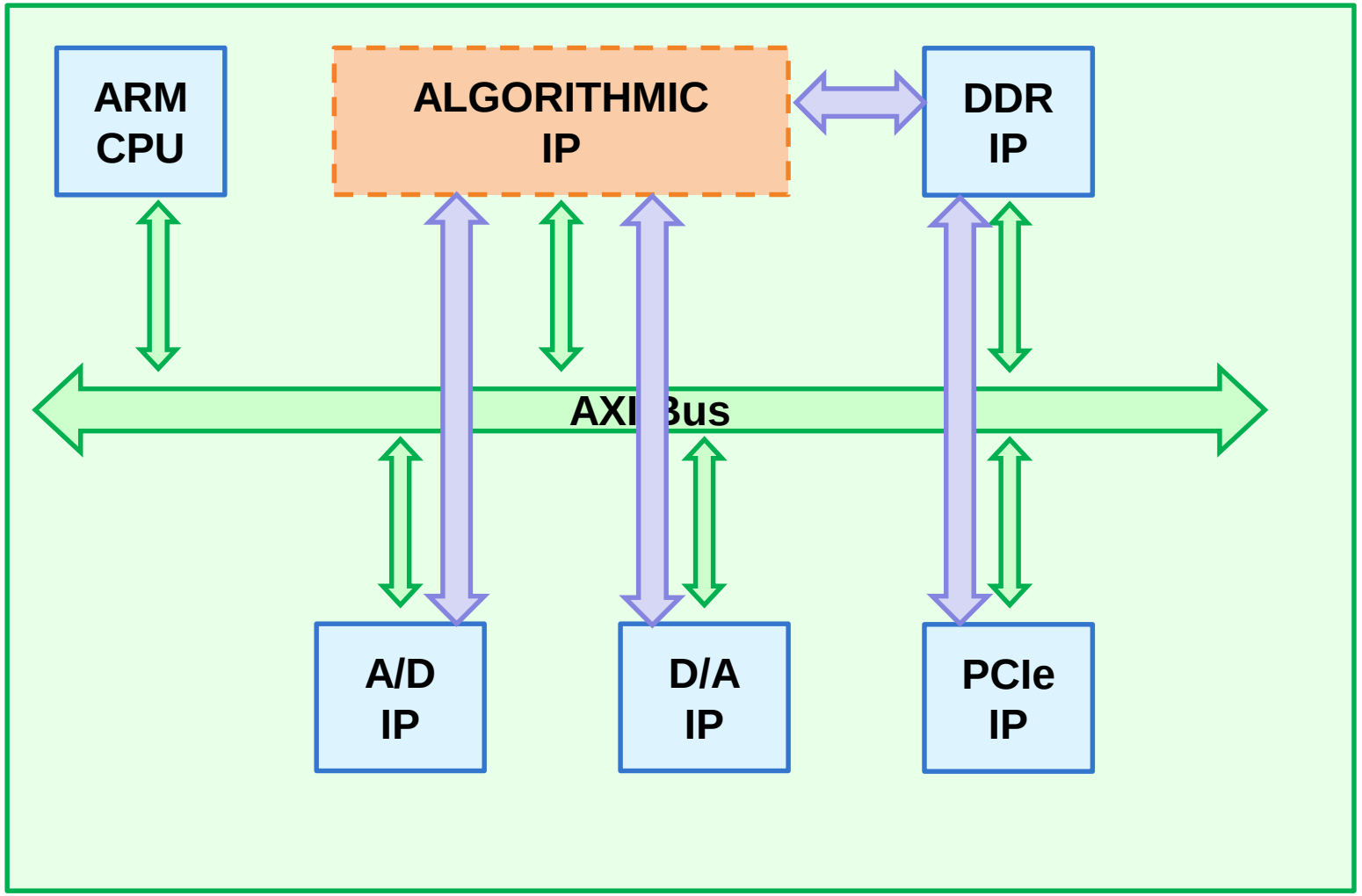
Custom Cyclone V SoC boards

Adding Support for Custom Altera SoC Boards and Reference Designs

Extensible Board and Reference Design definition



Reference Design Example

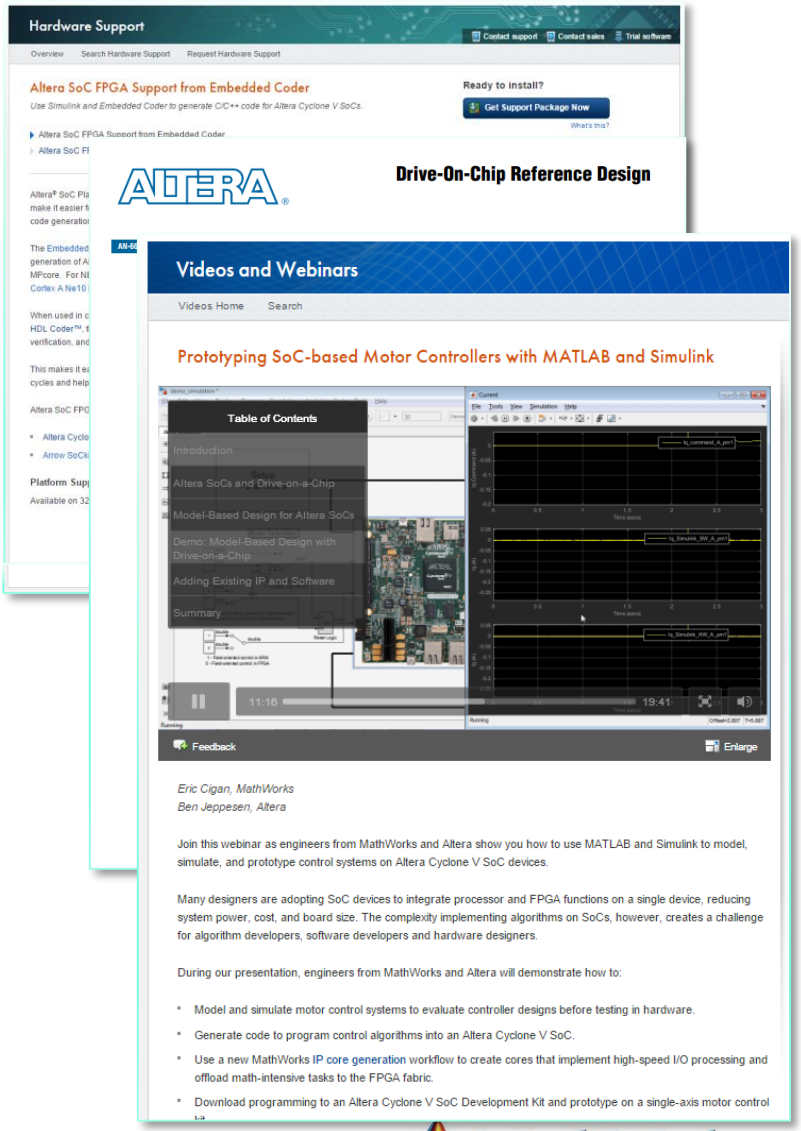


Summary and Next Steps

- Altera SoC workflow support from MathWorks:
  - Enables combined hardware/software code generation
  - Provides predefined support for on Altera SoC and Arrow SoCKit development boards, and can be extended to other SoC boards.

- Learn more about Model-Based Design for Cyclone V SoCs
  - Visit http://www.mathworks.com/asdf
  - Visit mathworks.com/alterasoc
  - Contact us at altera@mathworks.com for instructions on how to get this workflow.

- Watch Altera/MathWorks webinar
  Prototyping SoC-based Motor Controllers with MATLAB and Simulink
  - *Features targeting field-oriented control algorithm into Altera's Drive-on-a-Chip Reference Design*



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ALTERA SoC
DEVELOPERS FORUM