MATLAB EXPO 2017 KOREA

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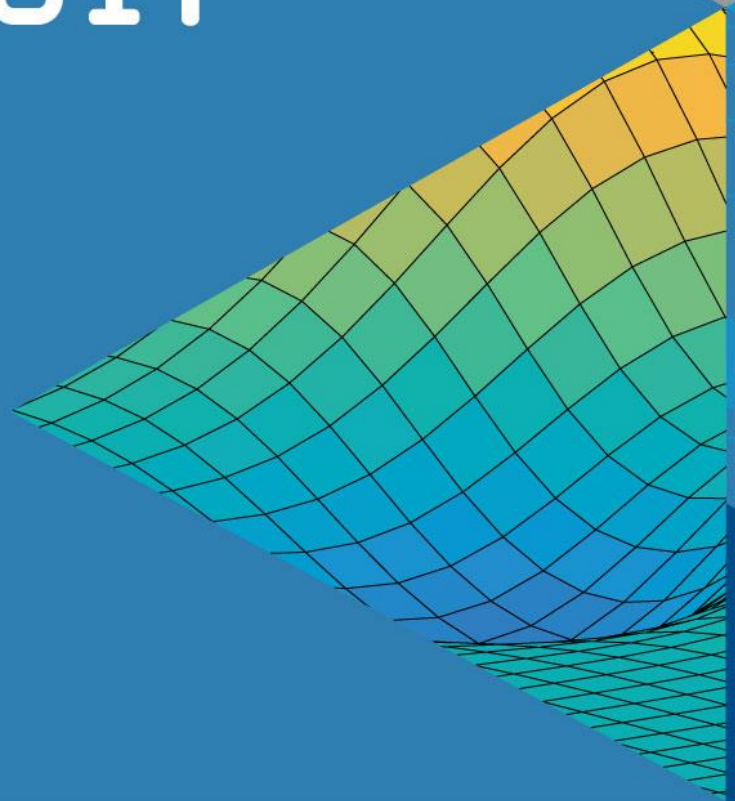

Better than Hand – Generating Highly Optimized Code using Simulink and Embedded Coder

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Key Takeaways

1. Reduce costs by optimizing hardware resources
2. Create innovative products that maximize algorithm content
3. Expand benefits of code generation to more applications

“The advantages of Model-Based Design over hand-coding in C can’t be overestimated.” Kazuhiro Ichikawa, Ono Sokki

Ono Sokki Reduces Development Time for Precision Automotive Speed Measurement Device

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Dr. Robert Turner, ABB

ABB Accelerates the Delivery of Large-Scale, Grid-Connected Inverter Products with Model-Based Design

Challenges

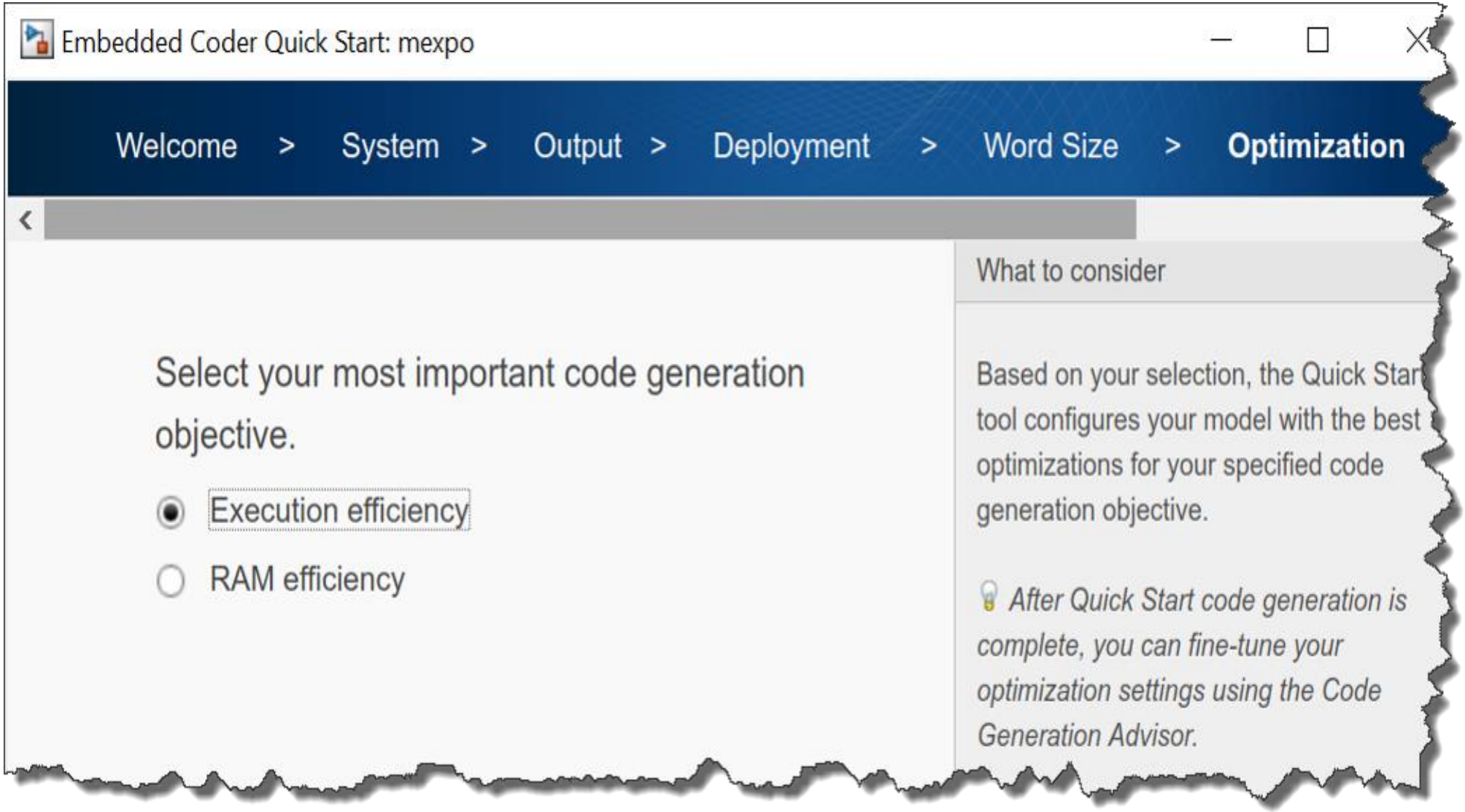
- Difficult to embed sophisticated, state-of-the-art algorithms into low-cost production hardware
  - Limited ROM, RAM, stack, and clock speed
- Not always known *a priori* during design, what embedded device or resource is required
  - Need to experiment to find optimal implementation
- Hand coding is process bottleneck
  - Introduces bugs, adds delays, reduces design iterations

Solutions

Optimization Techniques:

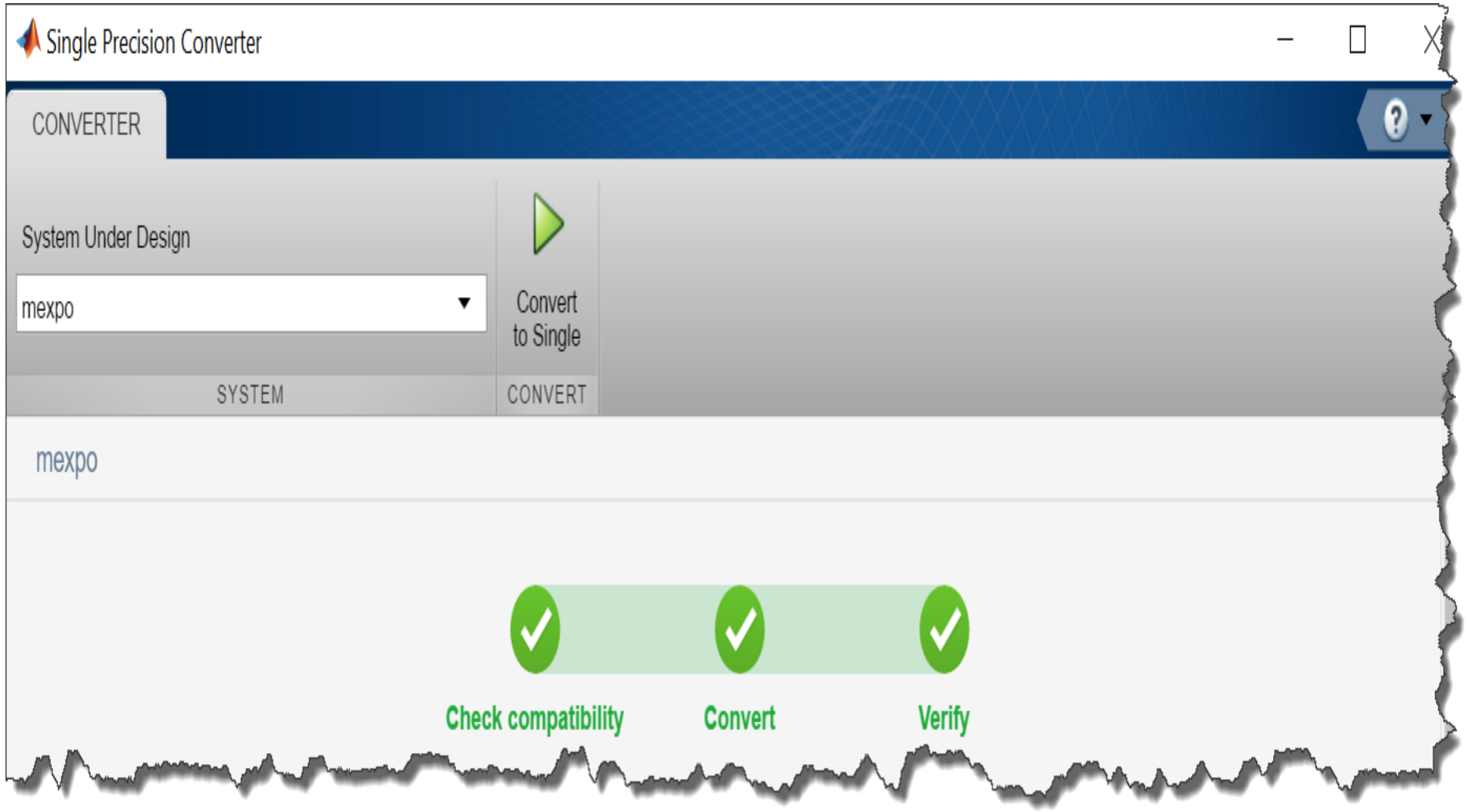
1. Use optimal settings
2. Minimize data sizes
3. Target vector engines
4. Select best processor(s)
5. Reduce data copies
6. Reuse components
7. Thrift logic

1. Use Optimal Settings



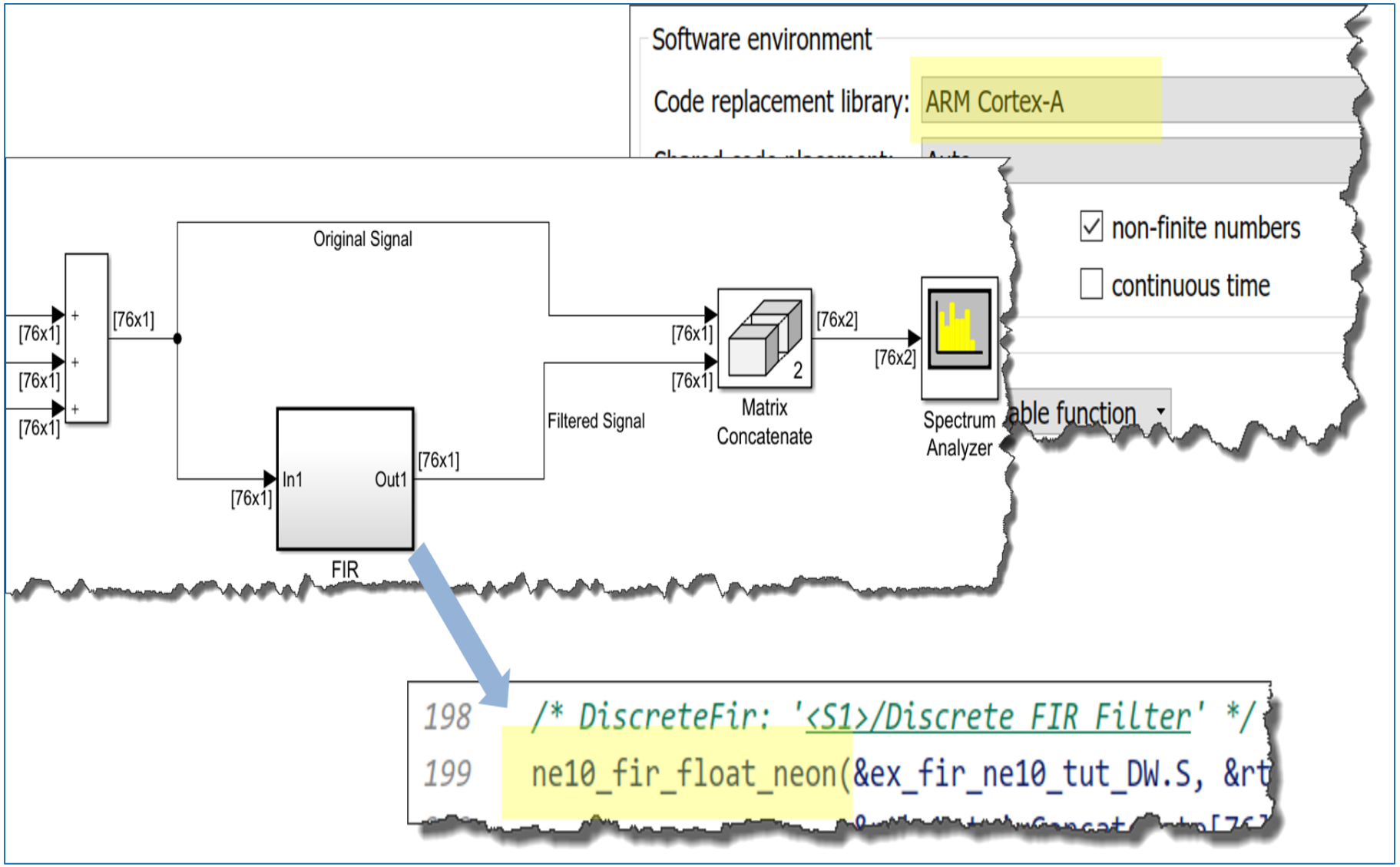
Features: Embedded Coder Quick Start

2. Optimize Data Types



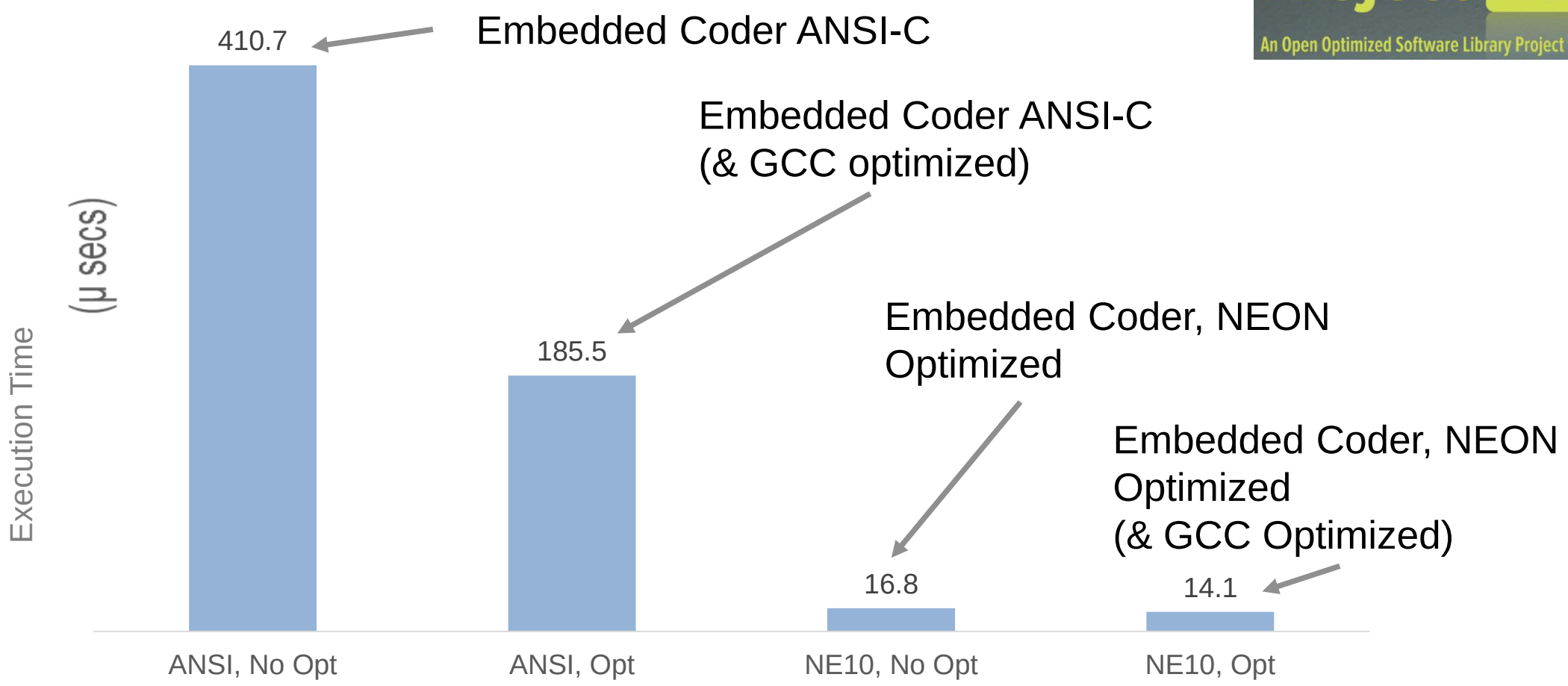
Features: Single Precision Converter

3. Target vector engines



Features: Code Replacements

PIL Benchmark Results for ARM Cortex-A

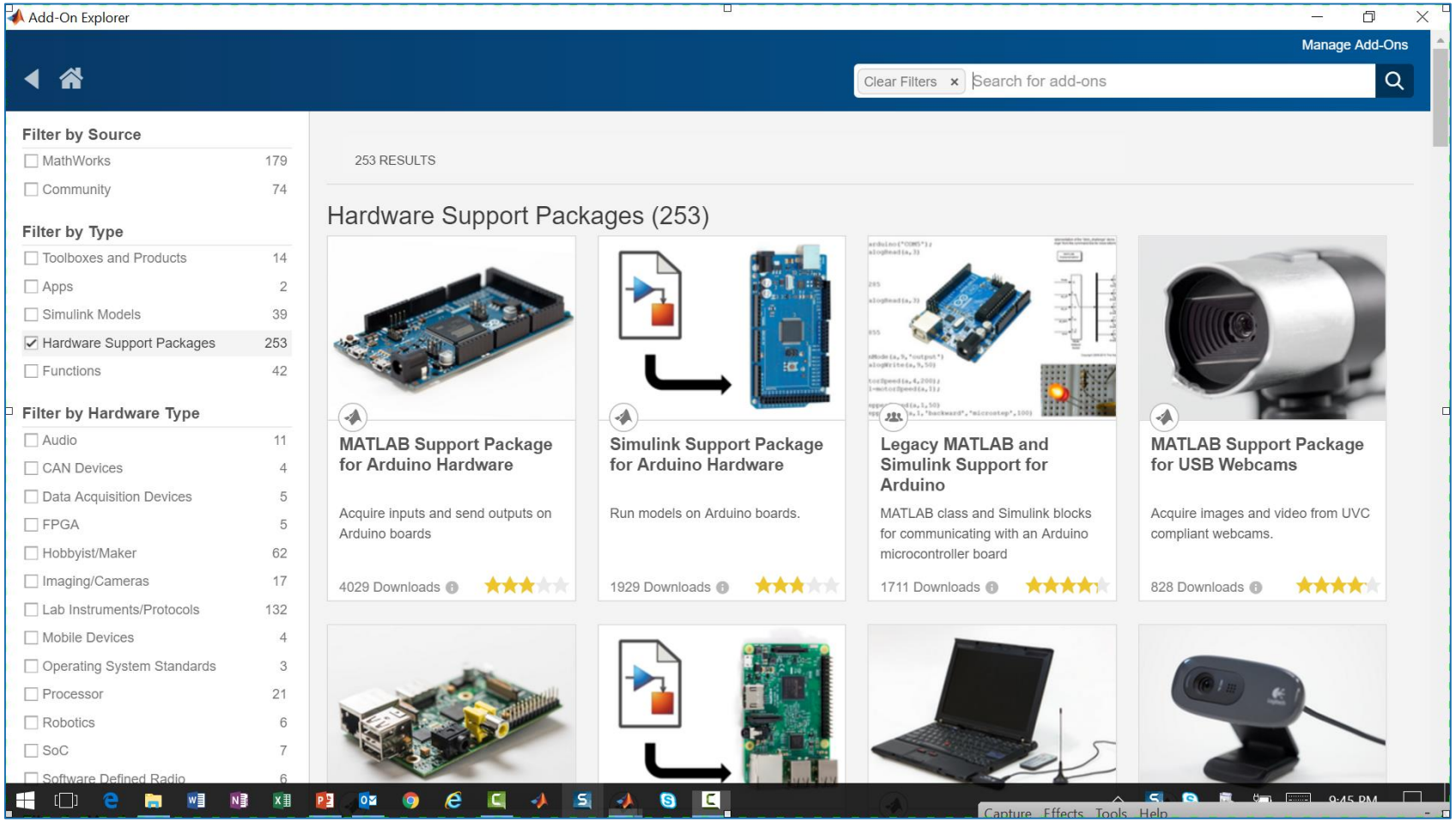


Run Format: [ANSI or Ne10], [gcc no opt or gcc -02], ARM 1Ghz Cortex A8

Example: FIR Filter

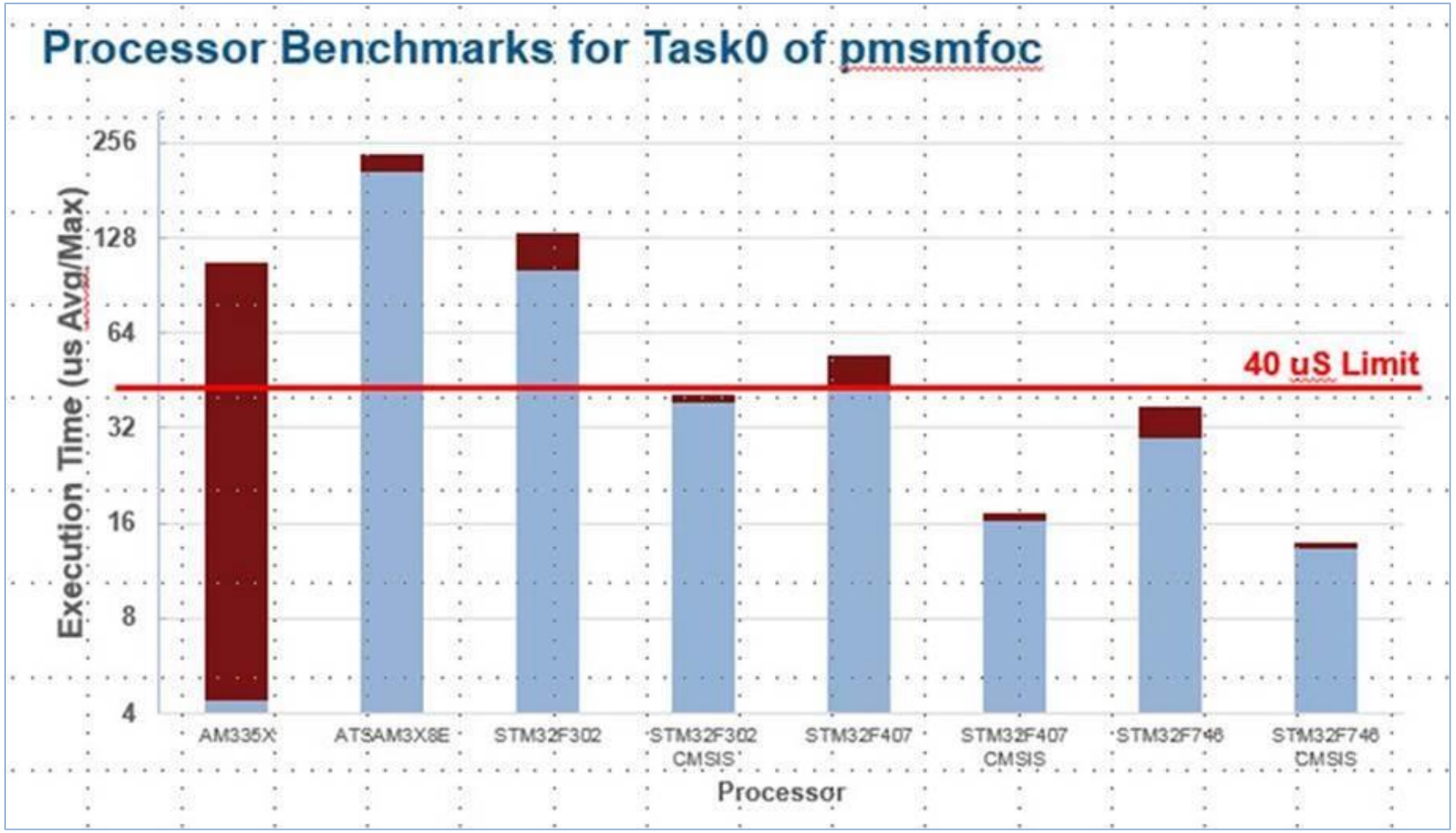
4. Select best processor(s) for your application

- Portable code: any device for **algorithm code generation**
- Support packages for **target-specific** system executable generation
  - ARM … Zynq
- Hardware vendors offer their **own target packages**
  - ADI, Infineon, Microchip, NXP, Renesas, STMicro, TI, ...

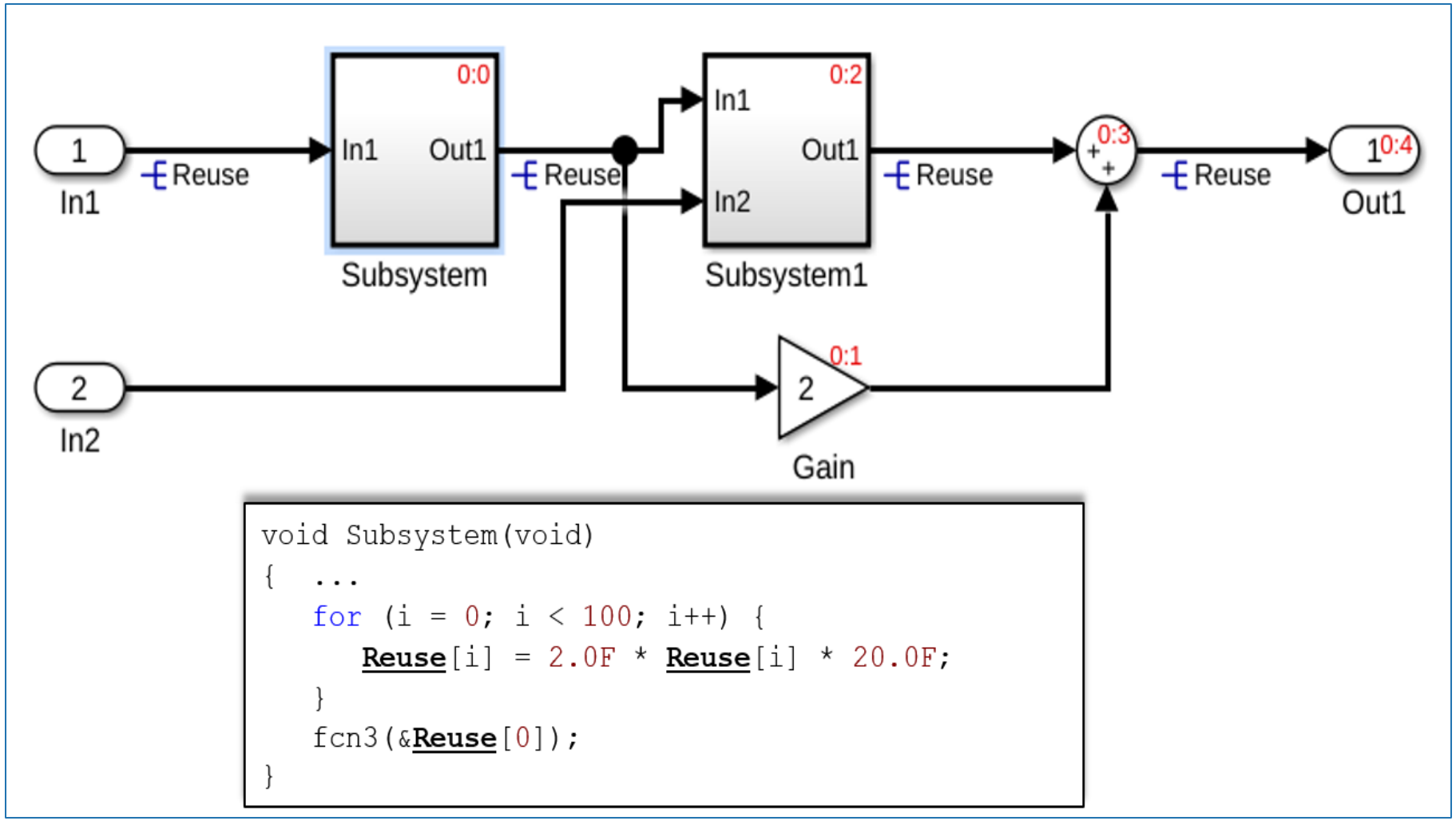


Results for PMSM Motor Control for ARM cores

- Average and Max Execution Time

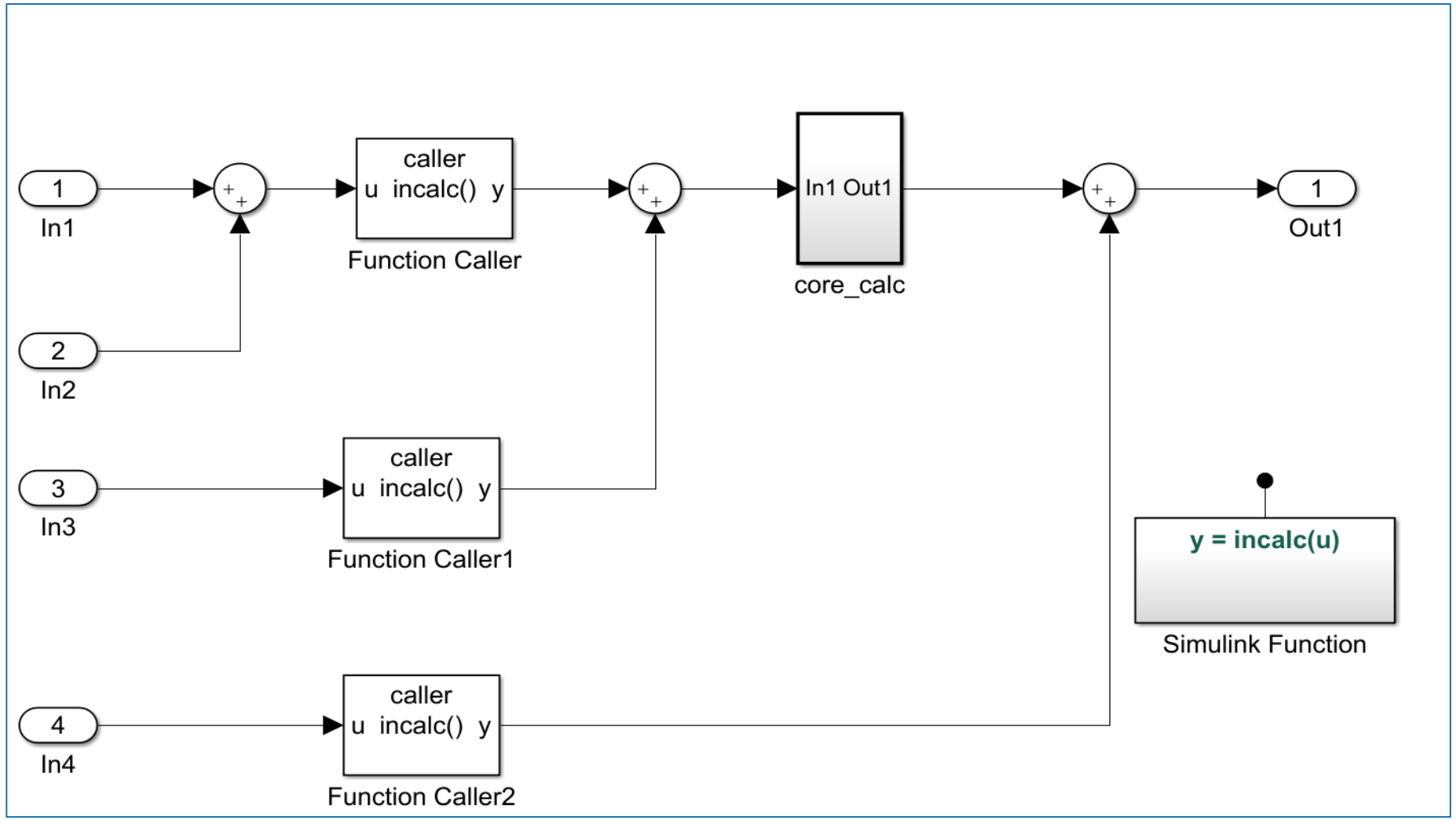


5. Reuse data



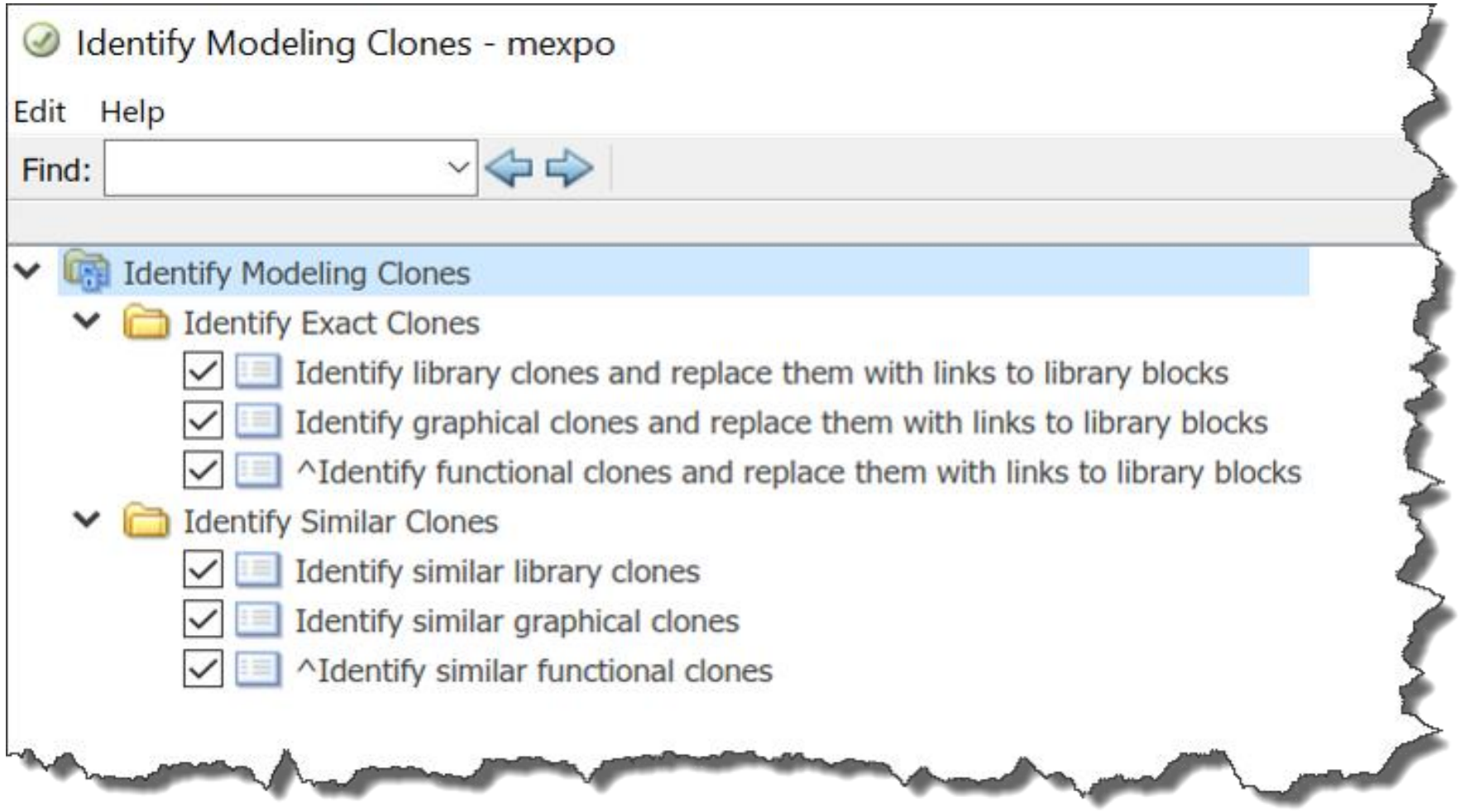
Features: Reusable Storage Classes

6. Reuse components



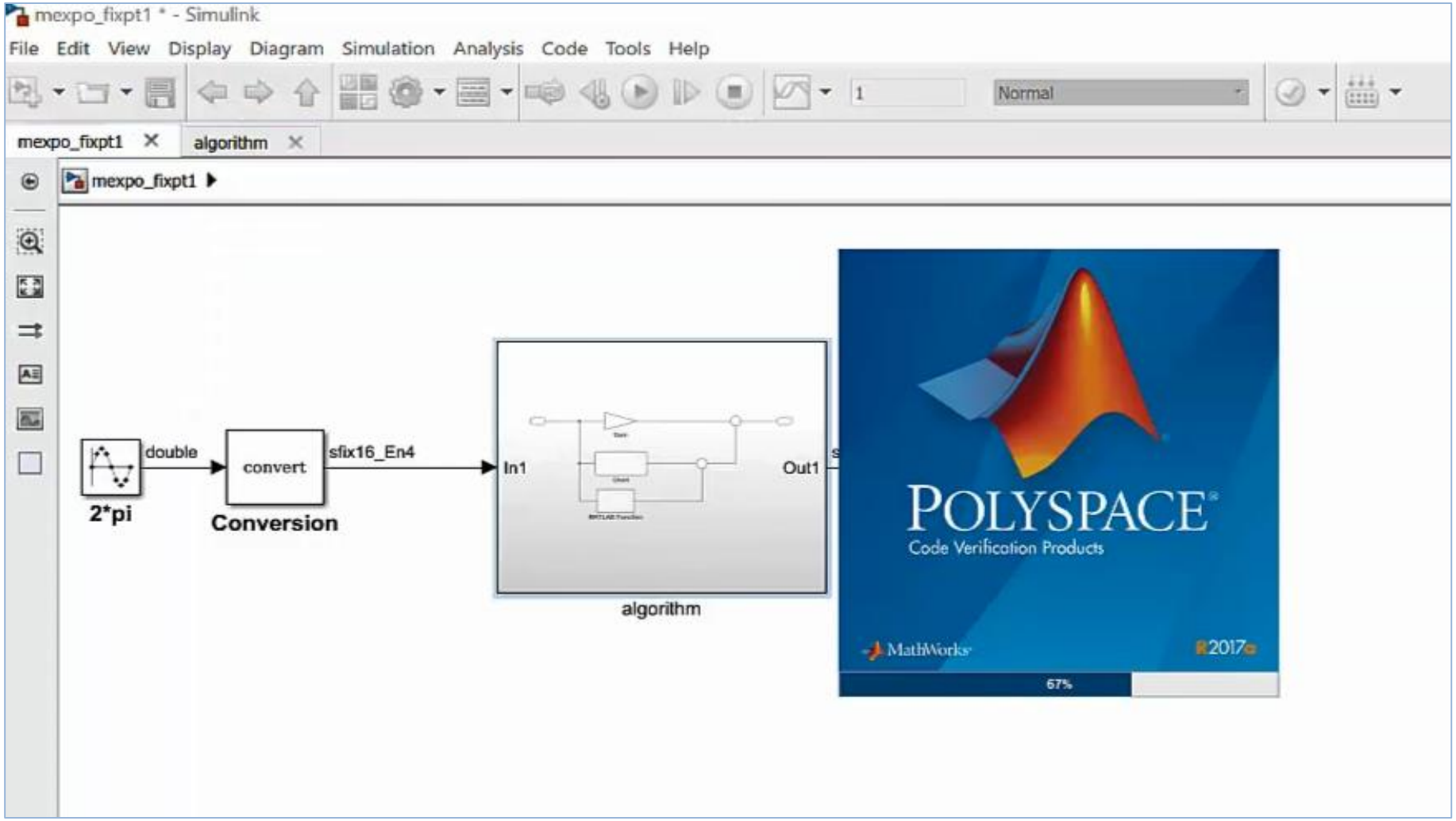
Features: Subsystem Reuse and Simulink Functions

7. Thrift Logic (Clone)



Features: Simulink Clone Detection

7. Thrift Logic (Prove)



Features: Polyspace Code Prover

Solution Summary

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Key Takeaways

Simulink and Embedded Coder new features let you:

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2. Create innovative products that maximize algorithm content
3. Expand benefits of code generation to more applications

"When we generated code from our Simulink models with Embedded Coder, the team we handed it off to knew it was gold"
Maria Radecki, BAE Systems

BAE Systems Delivers **DO-178B Level A** Flight Software on Schedule with Model-Based Design

Additional Customer References and Applications

Honeywell Aerospace, USA
Certified Flight Control Processor

FLIR Systems, USA and Sweden
Thermal Imaging FPGA

Festo AG, Germany
Robotic PLC

GM, USA
Powertrain ECU

Alstom Grid, UK
HDVC Power DSP

Baker Hughes, Germany
Oil and Gas Drill Processor

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