A unique processor architecture meeting LLVM IR and the IoT

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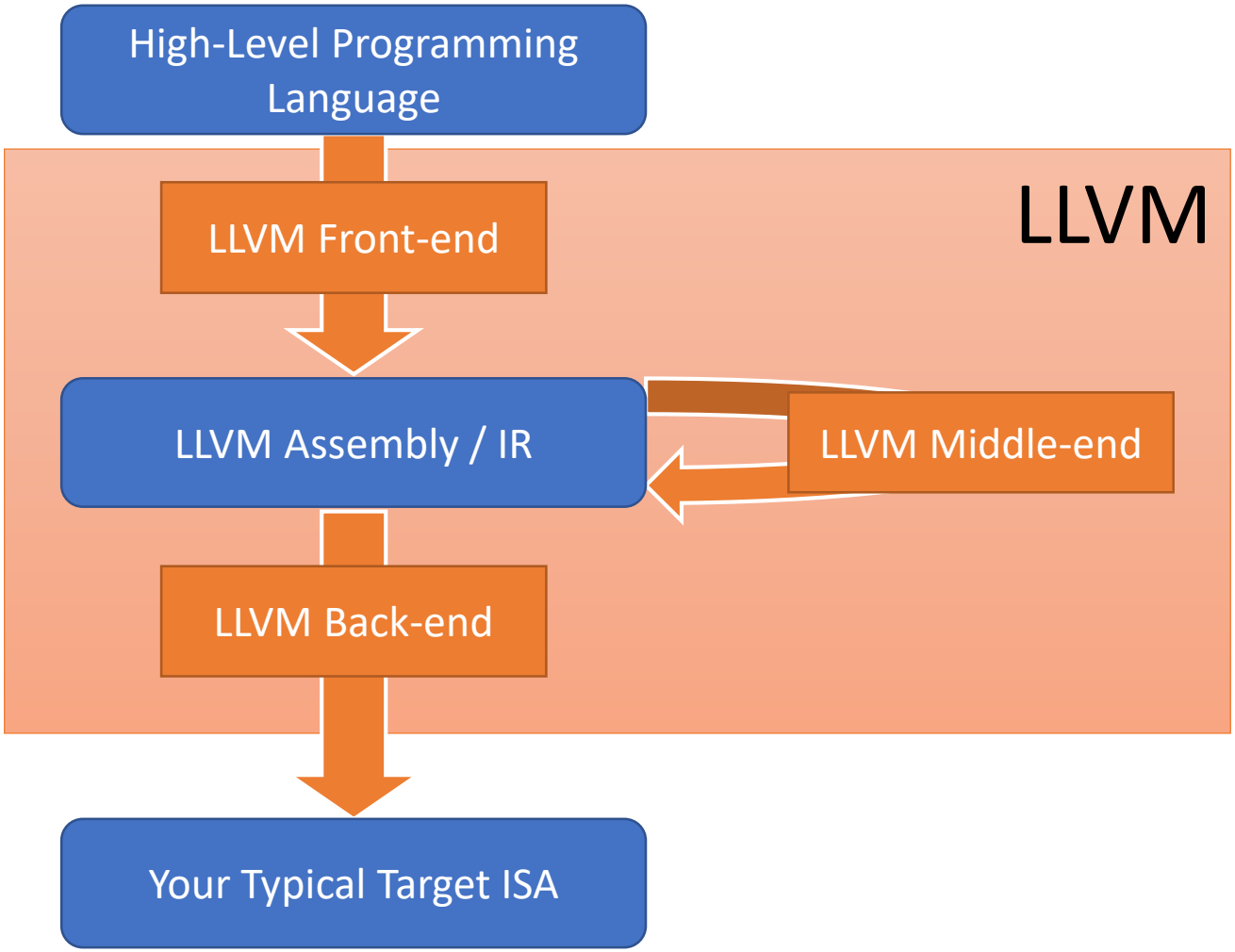
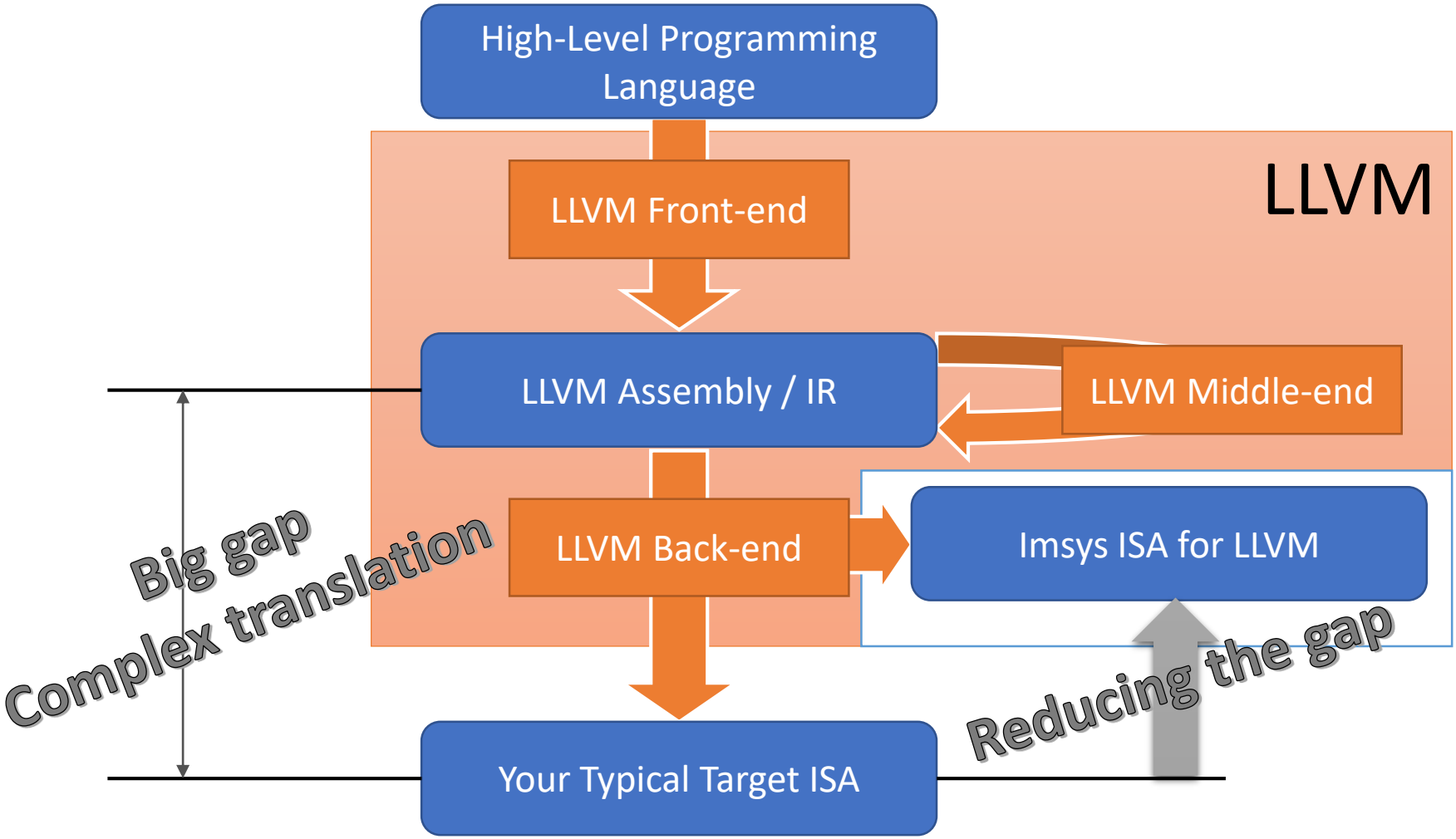
Compiling with LLVM



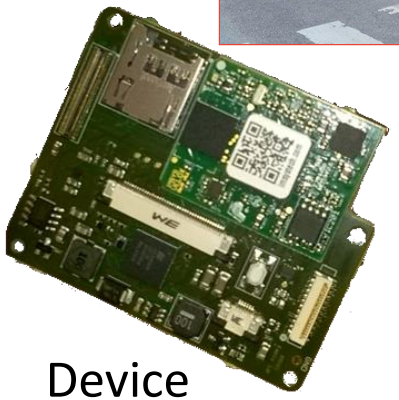
Improving Efficiency by Lifting Target



Agenda

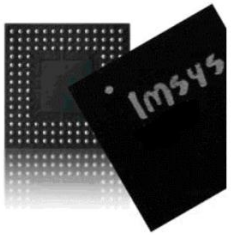
1. Imsys Company and the IoT
2. Imsys Lean Processing Technology
3. Imsys ISA for LLVM

Imsys AB



Device

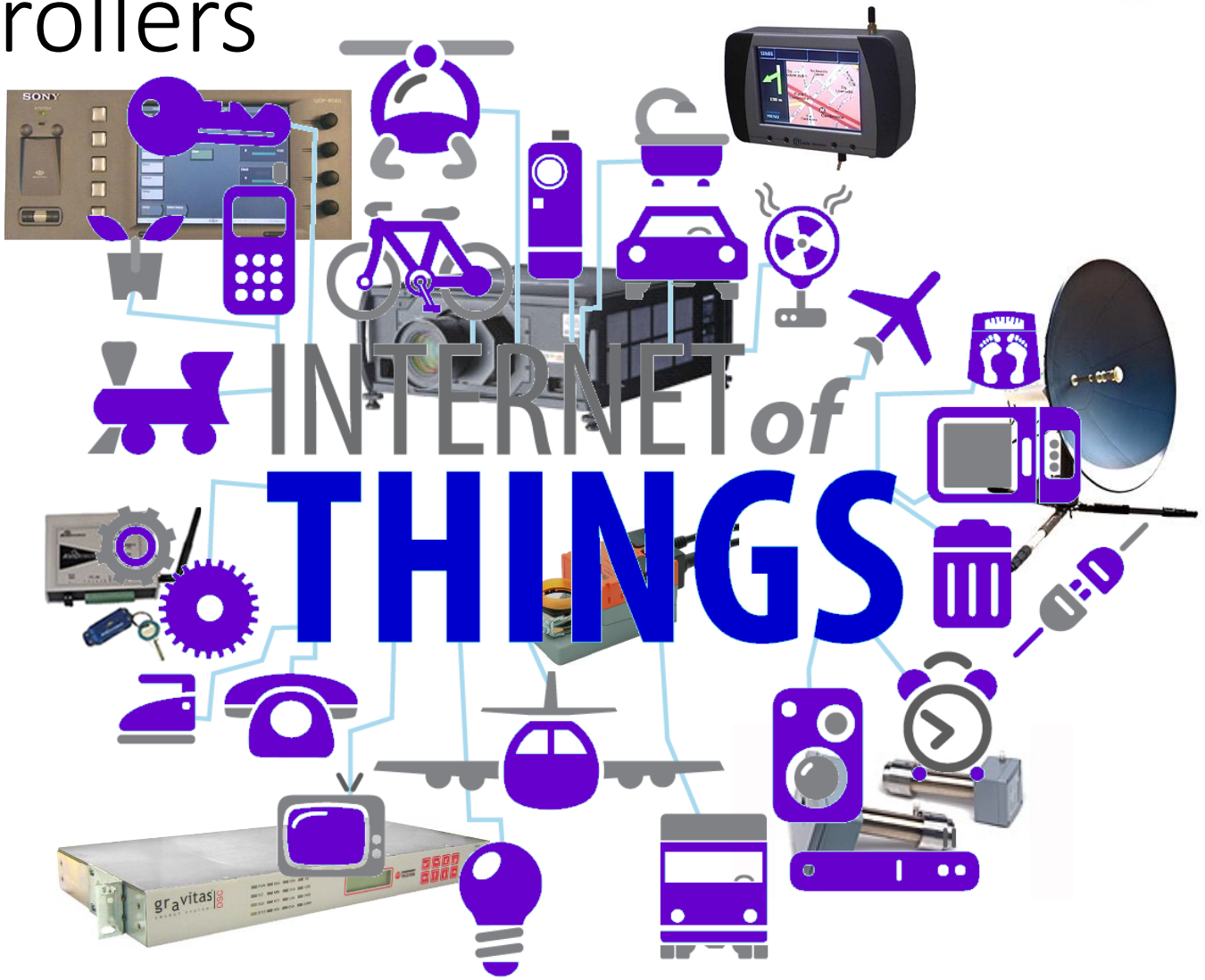
Module



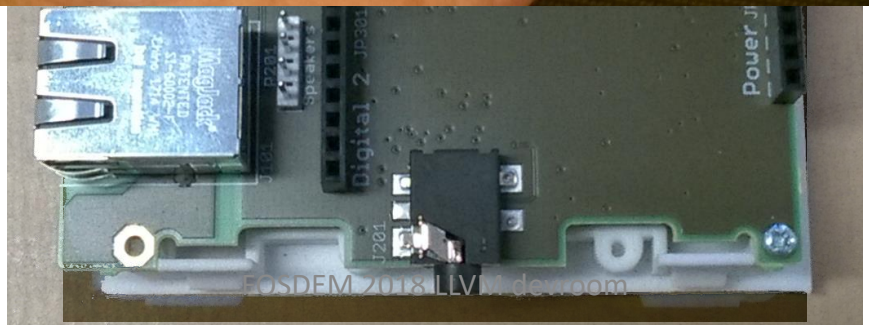
IC

IP

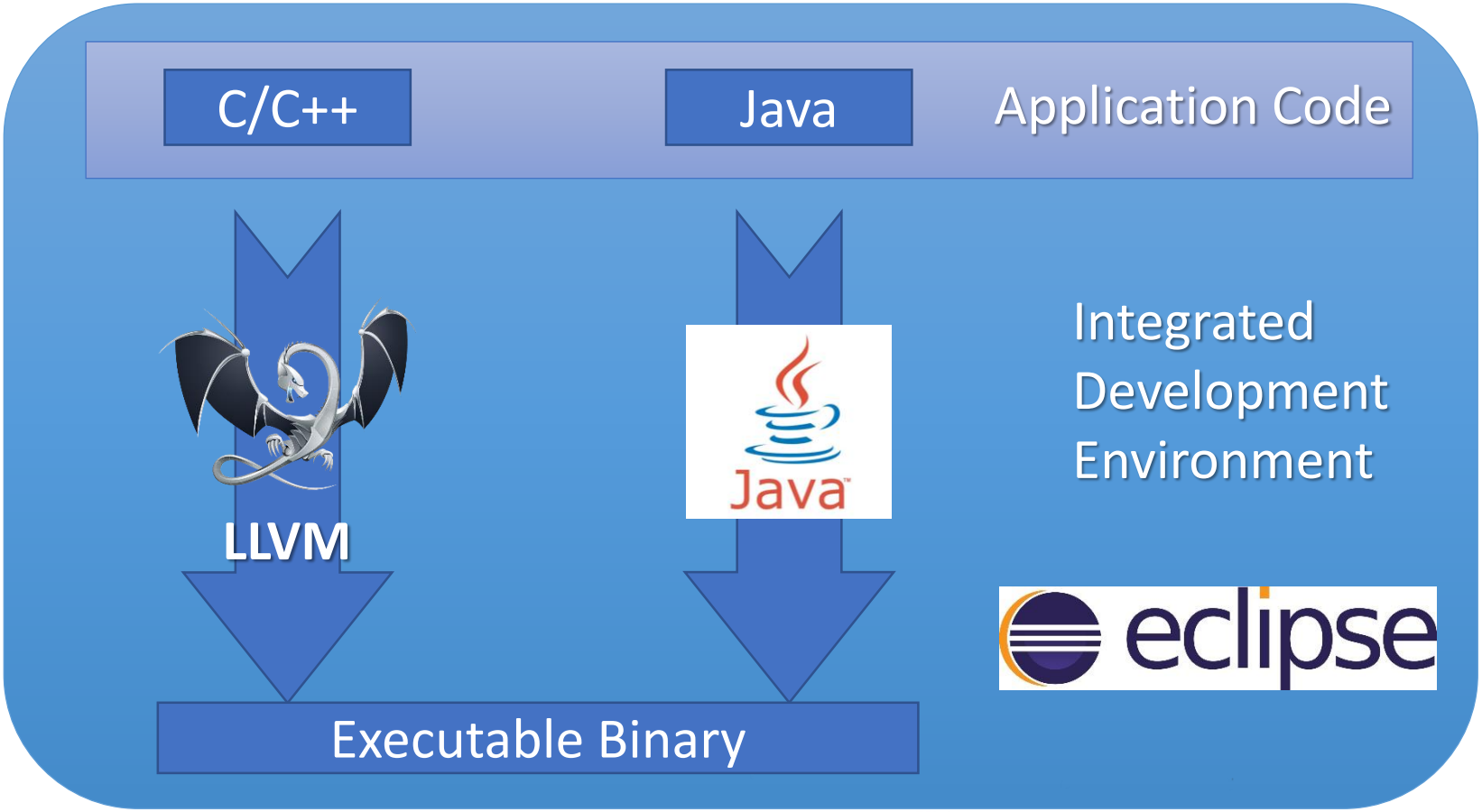
Networked Embedded Controllers



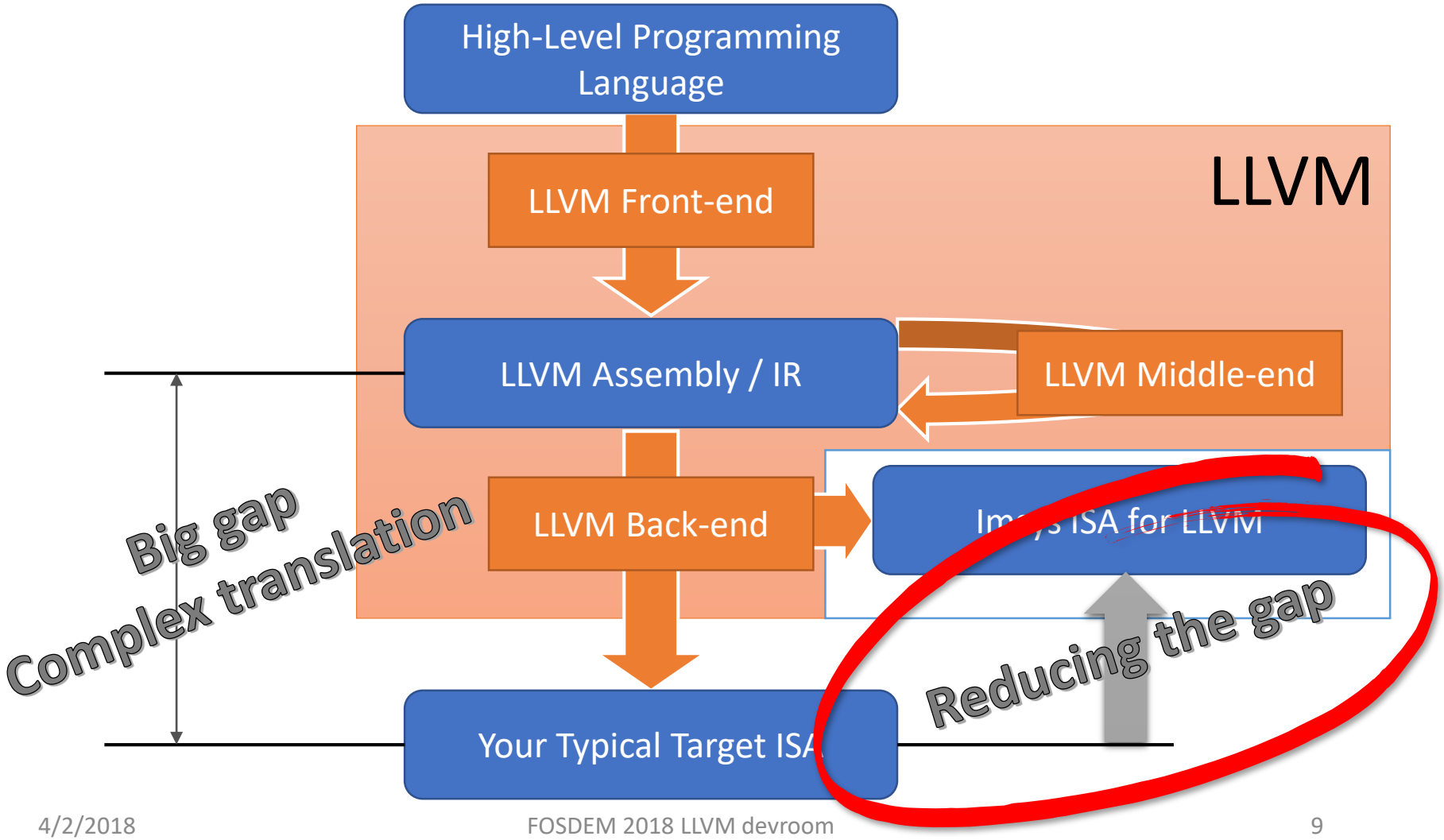
Imsys EMBLA
Single Controller Solution for the IoT



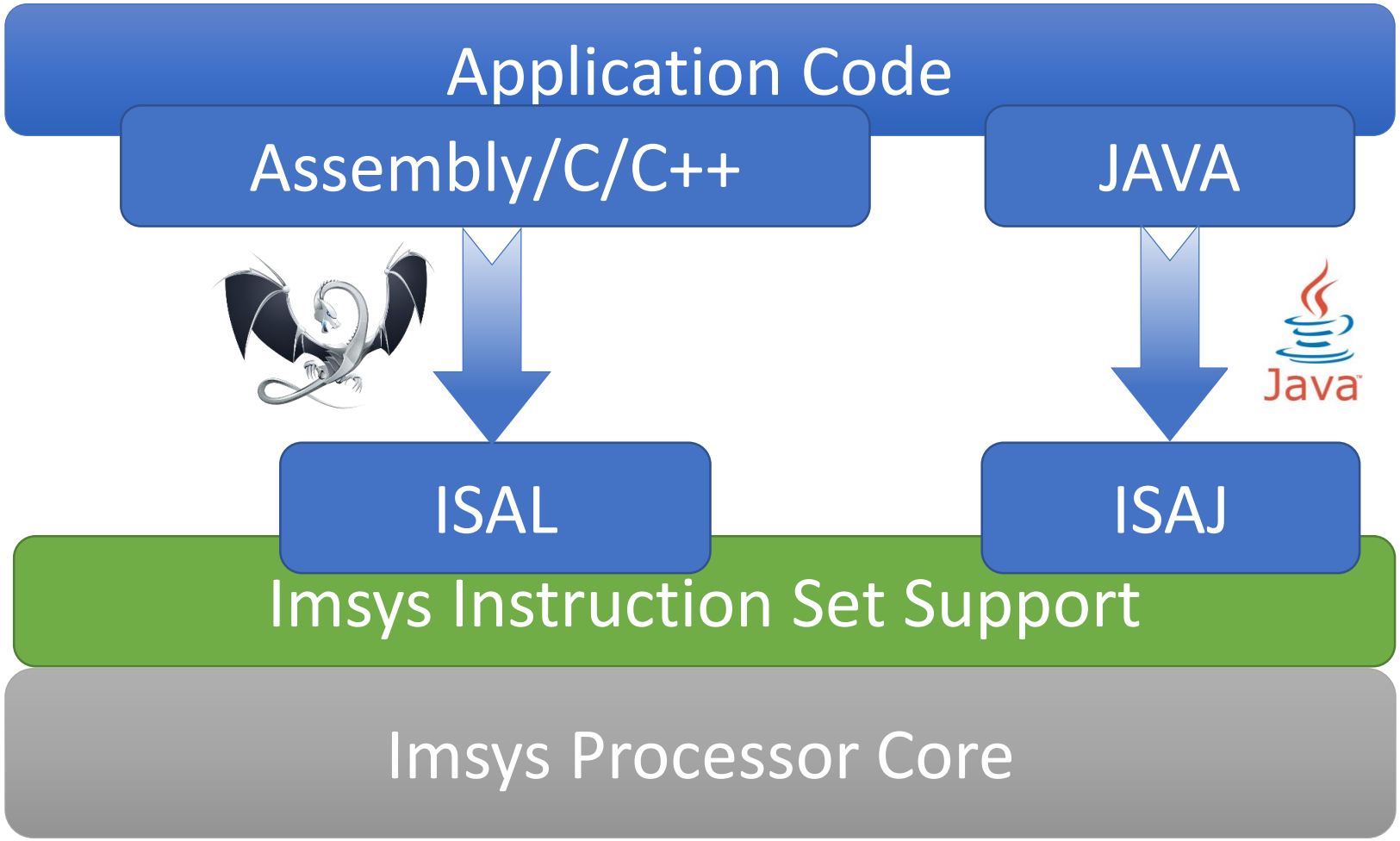
High-Level Software Platform



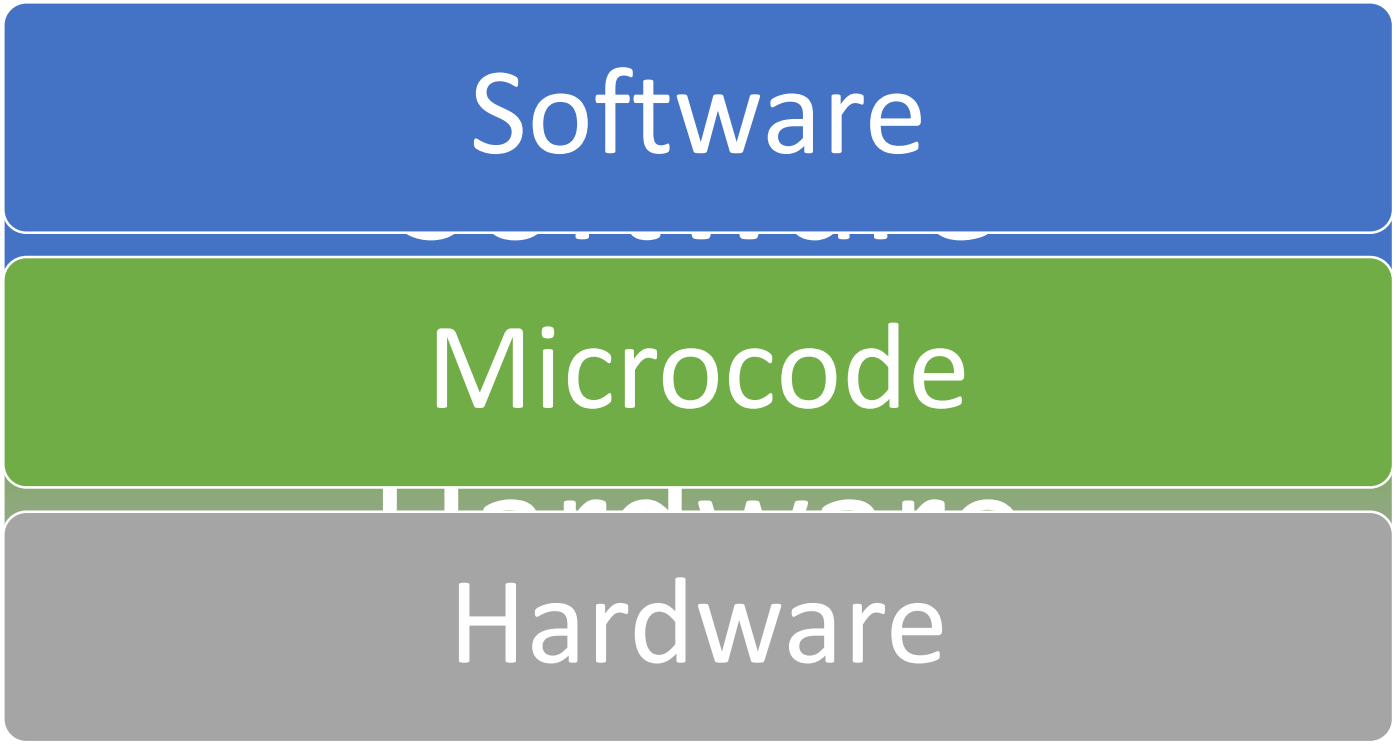
Improving Efficiency by Reducing the ISA Gap



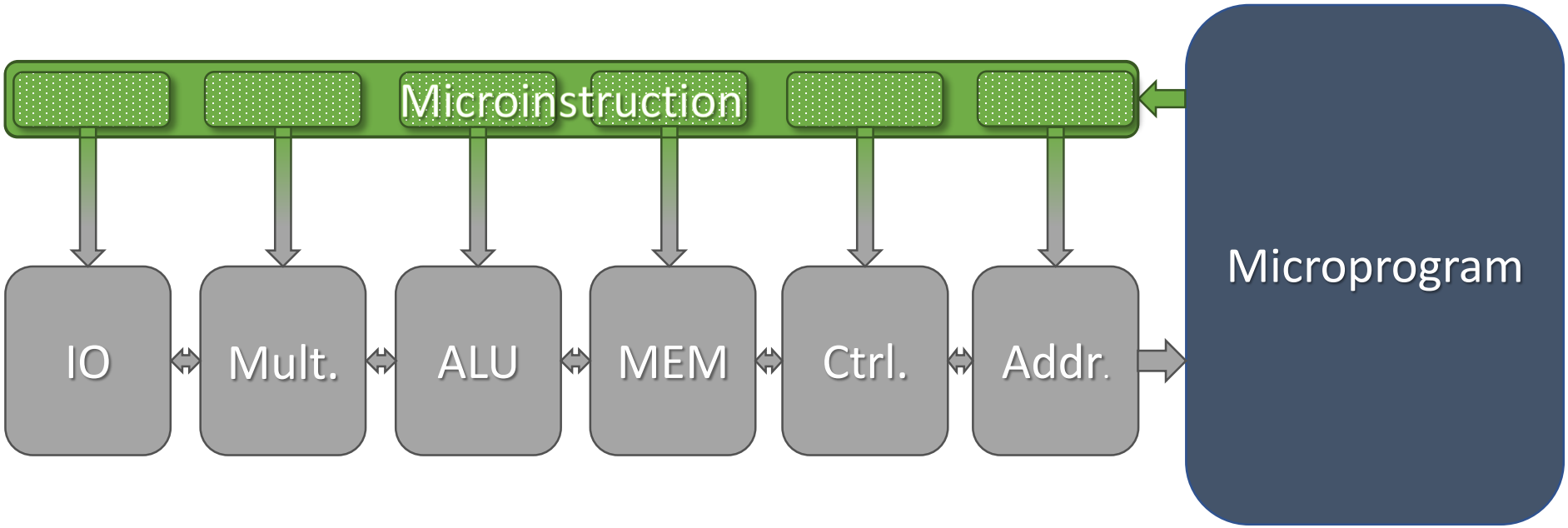
Abstraction Layers



A Forgotten Layer of Abstraction



The Processor Architect's Best Friend



Operation-Oriented Hardware Architecture

Complete Deterministic Control

Minimal Hardware

Maximum Efficiency

Microcode, what is it good for?

Flexibility

Soft-Reconfigurability

Abstraction Layers Revisited

Application Code

ISAL

Imsys Instruction Set Support

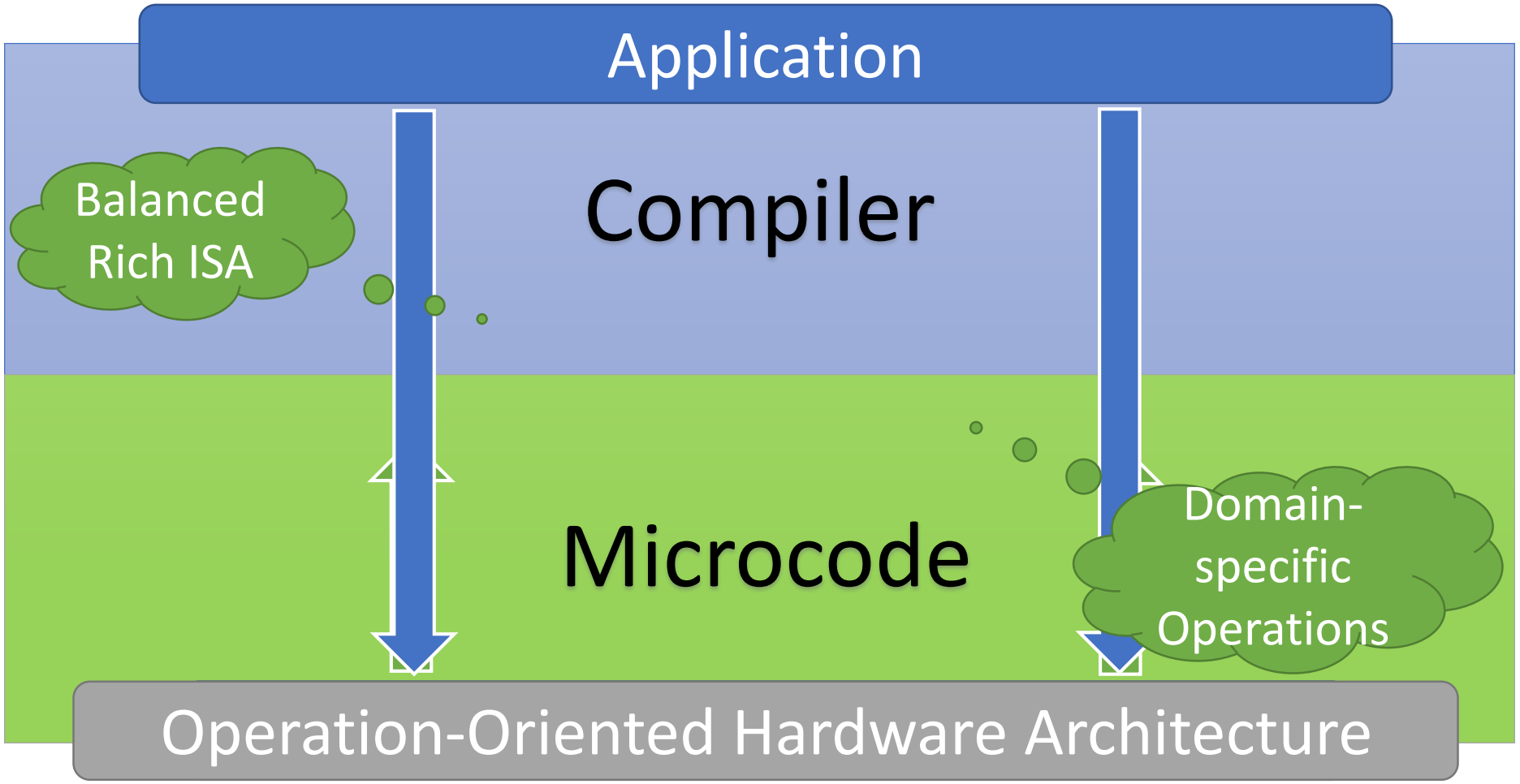
Imsys Processor Core

Software

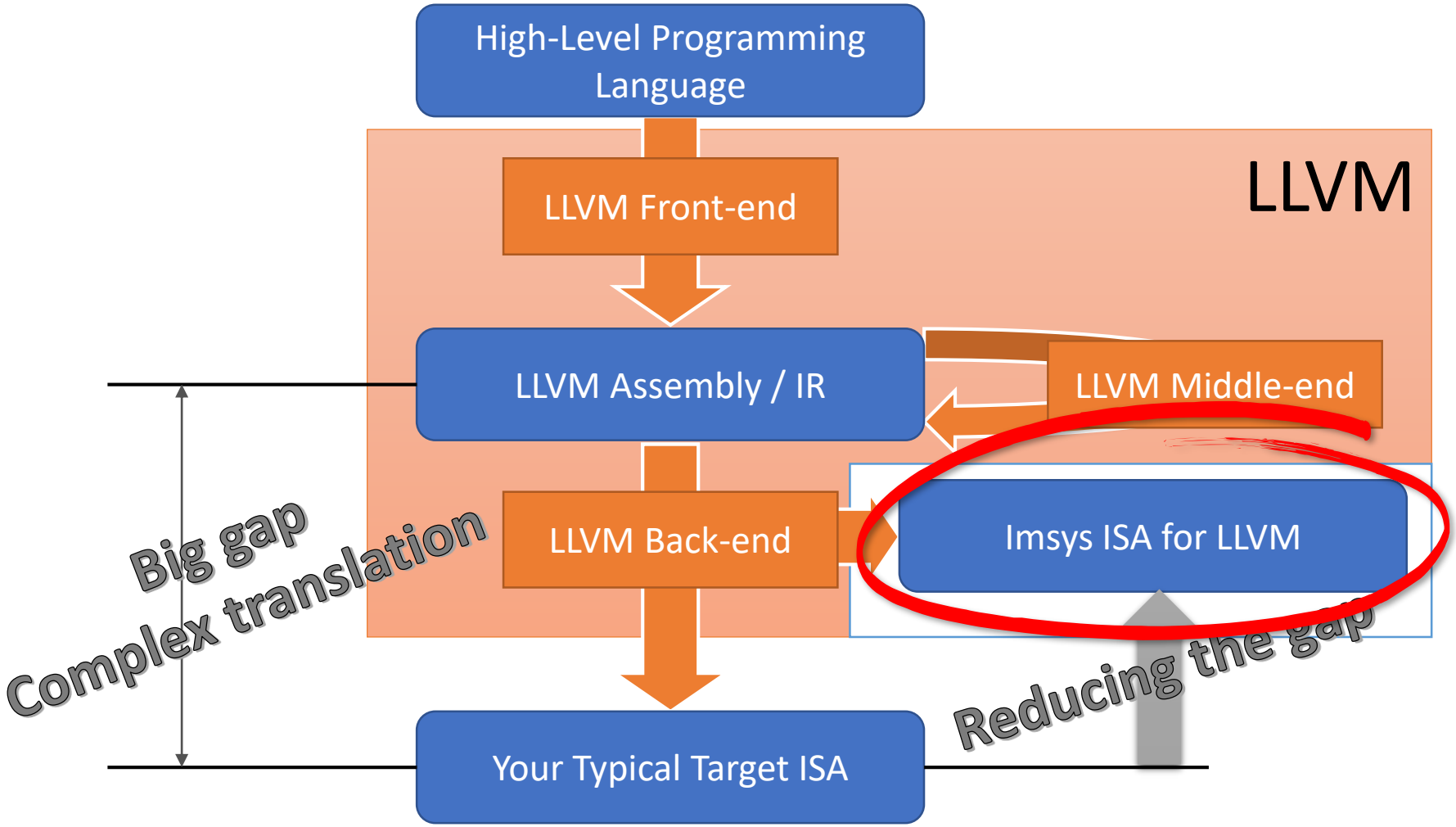
Microcode

Hardware

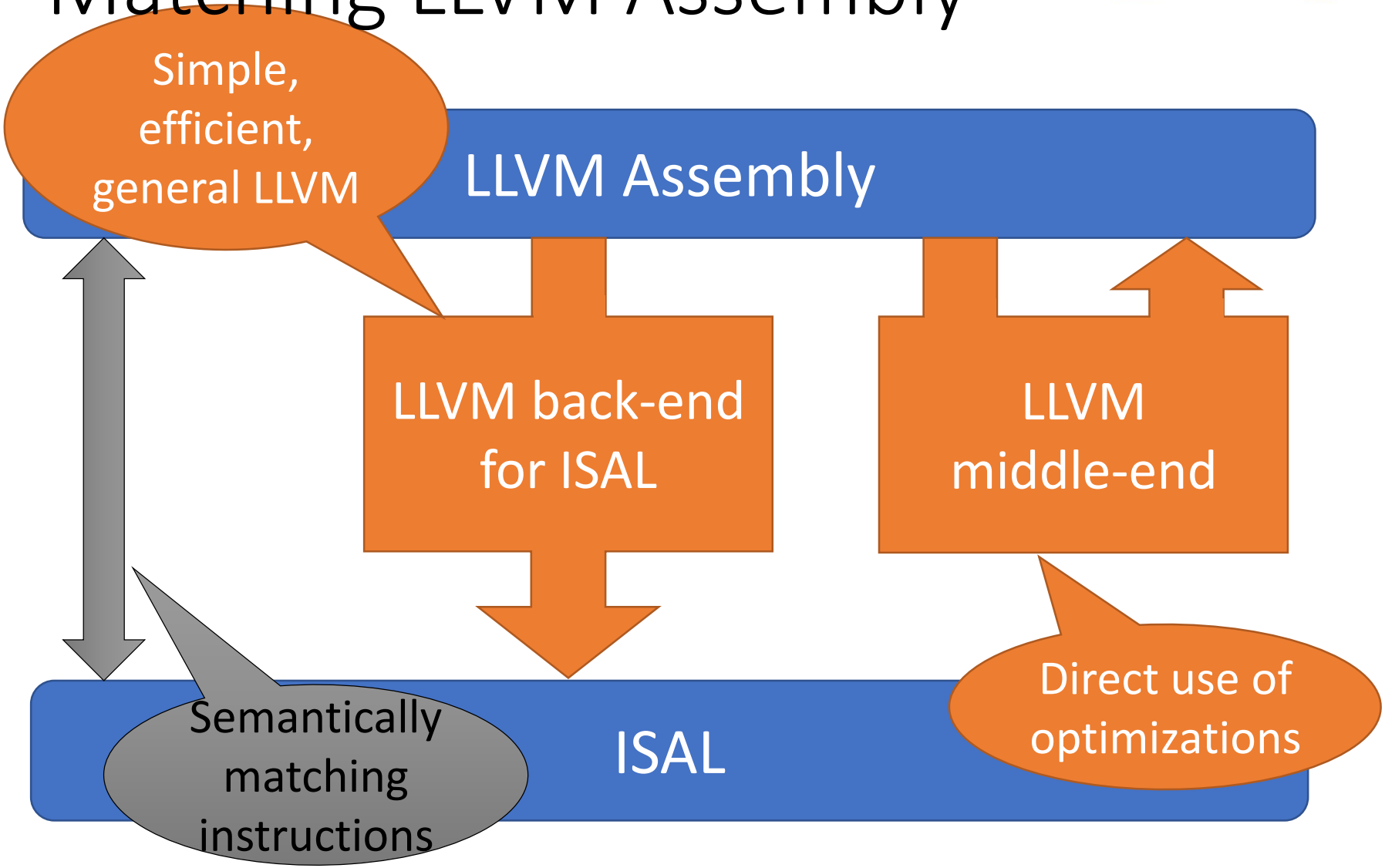
A Unique Balance between Hardware and Software



Improving Efficiency by Matching LLVM Assembly



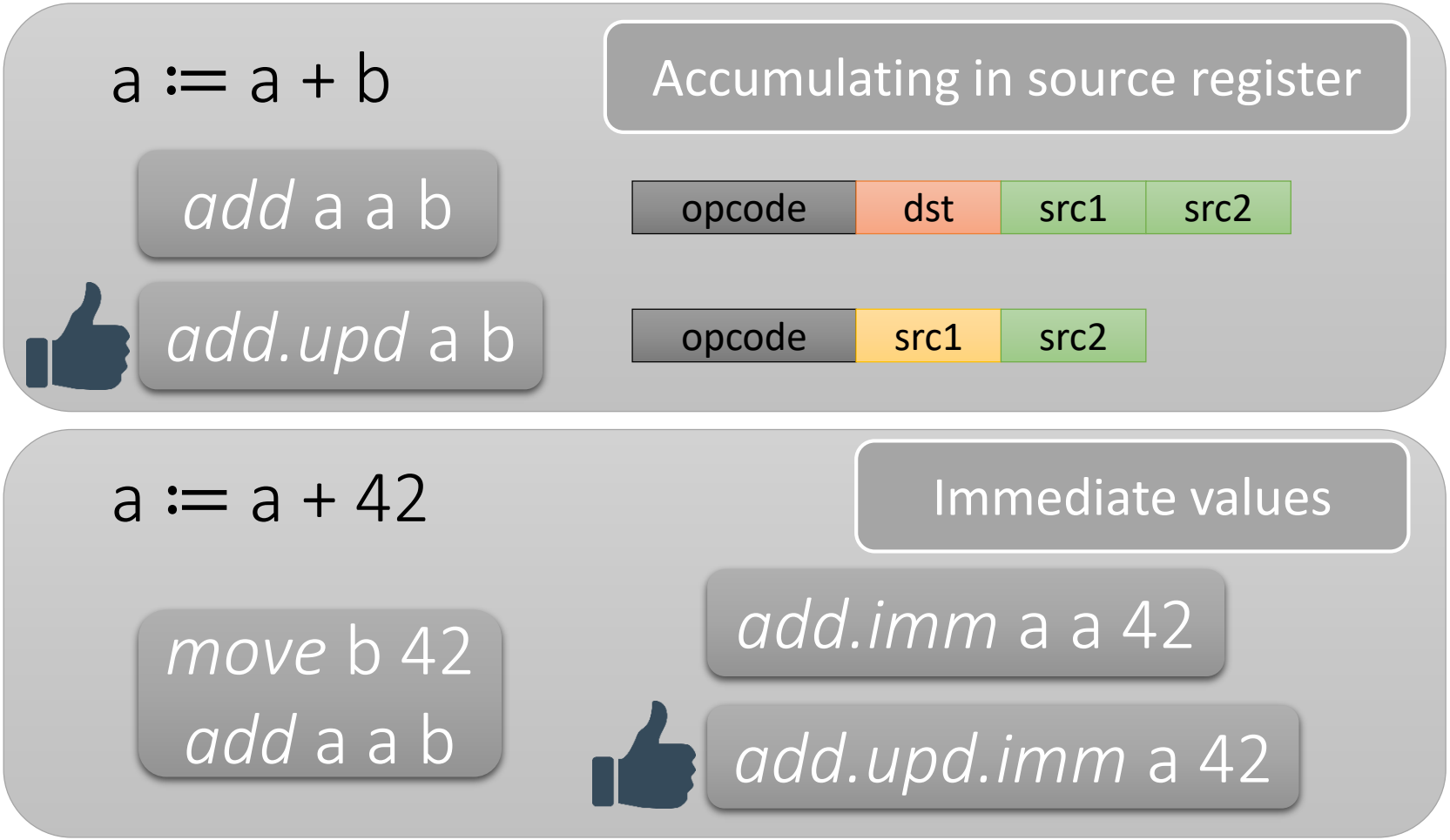
Matching LLVM Assembly



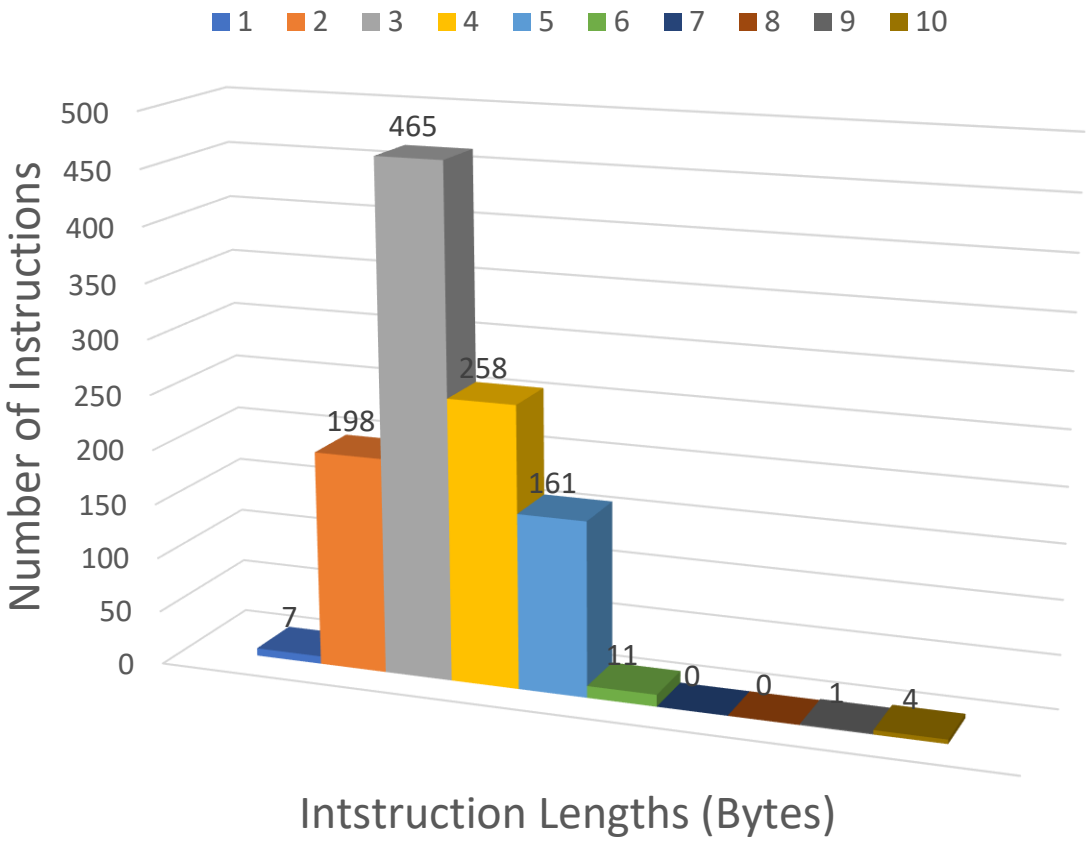
Meeting a Constrained Reality

	LLVM Assembly	ISAL
Operations	Instructions & intrinsic functions	Additional system operations
Single Value Types	Virtually unlimited	Set of integer, floating point, pointer, and vector types
Registers	Unlimited	Register windows
Arguments	Source and destination registers	Registers with support of accumulating in source registers, immediate values
Binary Representation	Bitcode	Custom dense binary coding

Optimized Operation Sequences



Optimized Binary Representation



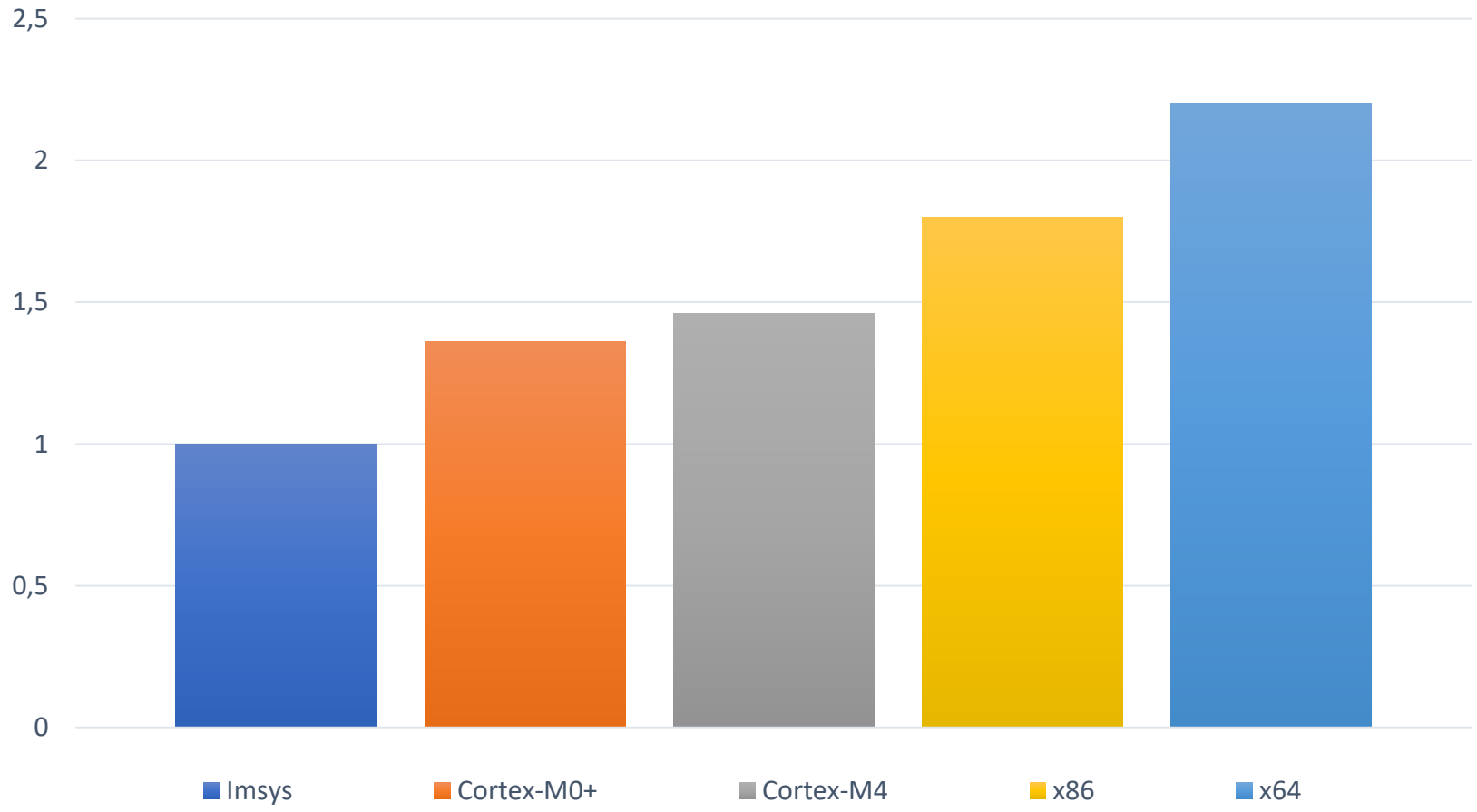
Maximize Code Density

Optimize Microcode Size

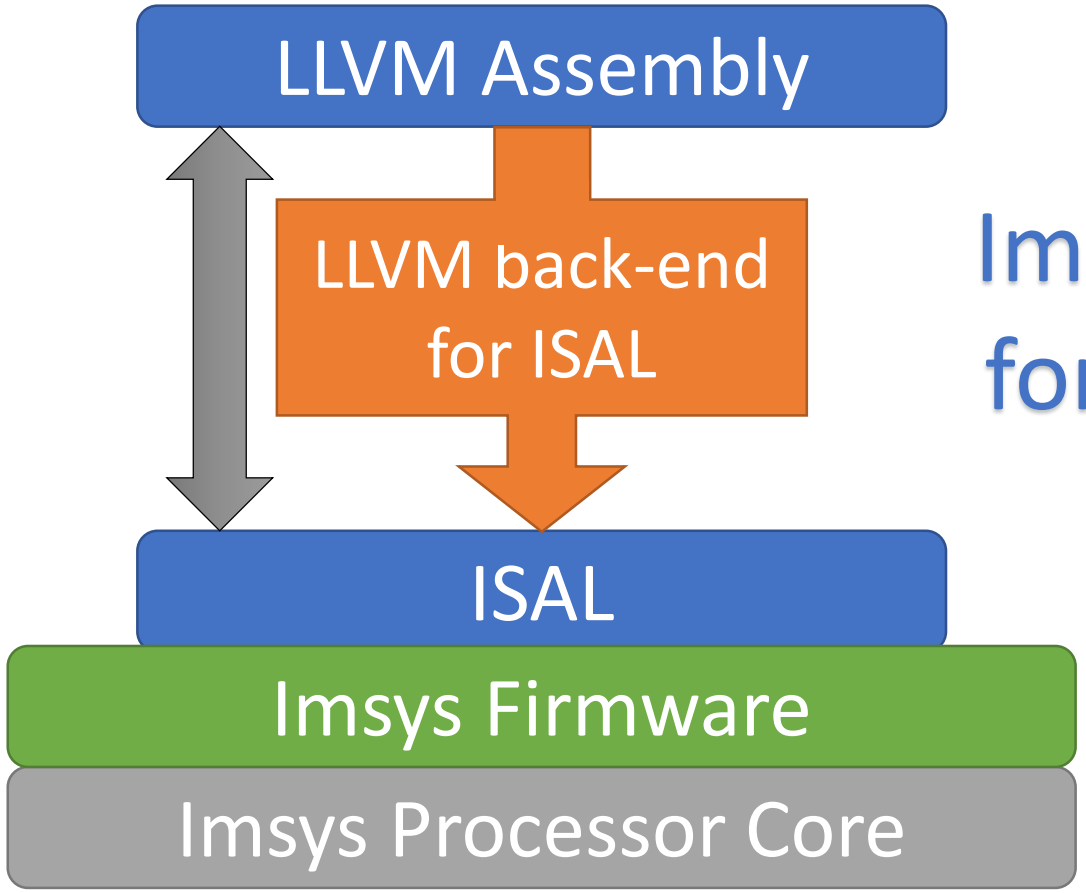
Minimize Execution Time

Variable-length Instructions

Average Binary Size of TI Suite



ARM Cortex requires 35%+ more, Intel 80%+ more program memory.



Imsys

Imsys ISA for LLVM

Imsys EMBLA with ISAL

Imsys Lean Processing Technology

Imsys

Leaner is Meaner

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