

# Multi2C: an open GPU compiler backed by LLVM

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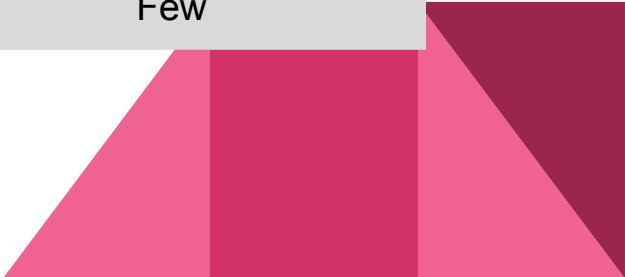
# Why?

## Research:

|     | Duration | Compiler | Simulator |
|-----|----------|----------|-----------|
| CPU | Decades  | Abundant | Abundant  |
| GPU | Recently | Limited  | Limited   |

## Tools:

|     | ISA level Compiler      | ISA level Simulator     |
|-----|-------------------------|-------------------------|
| CPU | Proprietary/Open Source | Proprietary/Open Source |
| GPU | Proprietary             | Few                     |



# Why?

## Open Source Benefits:

### **Possibility**

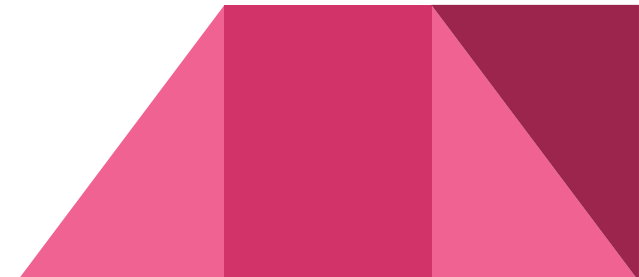
Innovation in software/hardware co-design

### **Flexibility**

Less constraints from hardware vendors

### **Community support**

Bug fixes & improvements from upstream projects



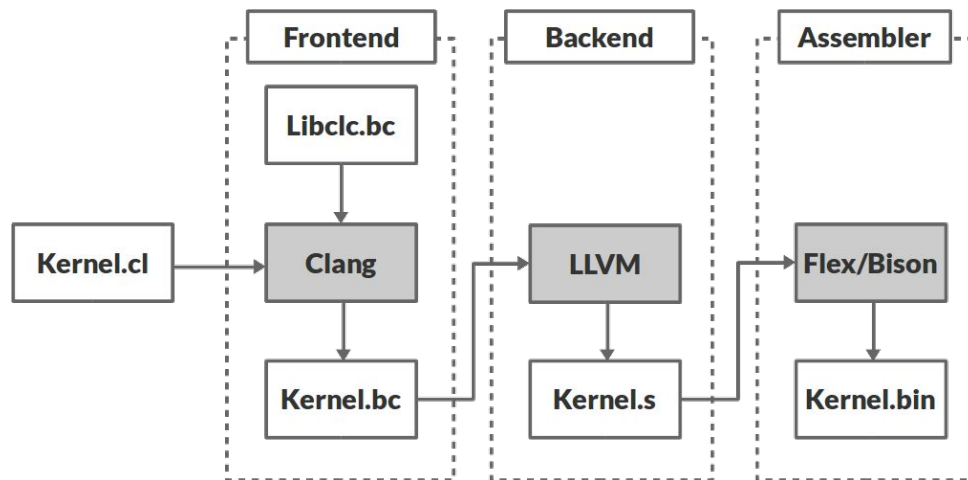
# How?

## Multi2C compiler:

Based on open source projects/tools: **Clang**, **LLVM**, **Flex** and **Bison**

Works with **Multi2Sim**, an open source heterogeneous simulation framework

Compiles **OpenCL** kernel source to **AMD** Southern Islands GPU, **GCN 1 ISA**



# How?

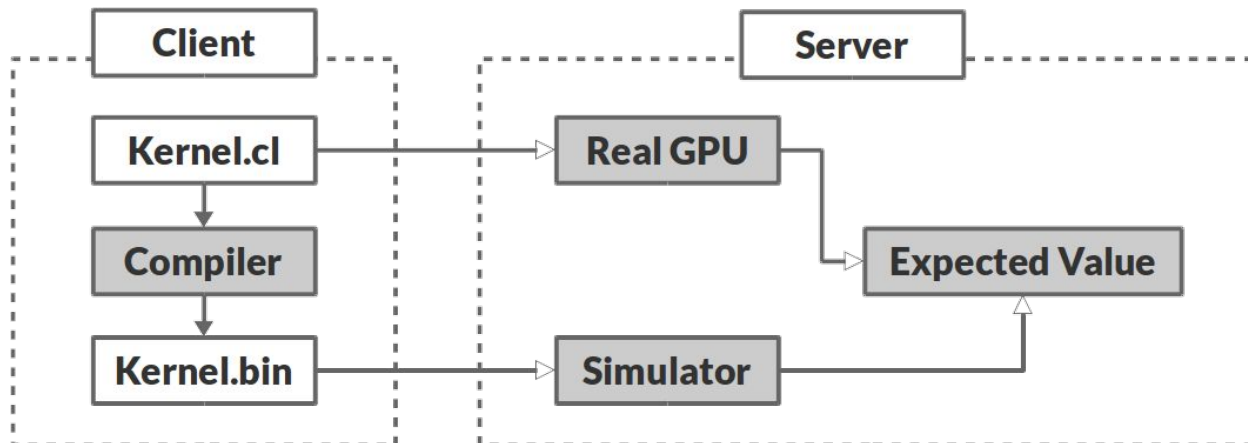
## Multi2C testing framework:

Cross verification suite for any OpenCL compiler:

Level 0 : Auto-generated unit test kernels

Level 1 : Selected test kernels

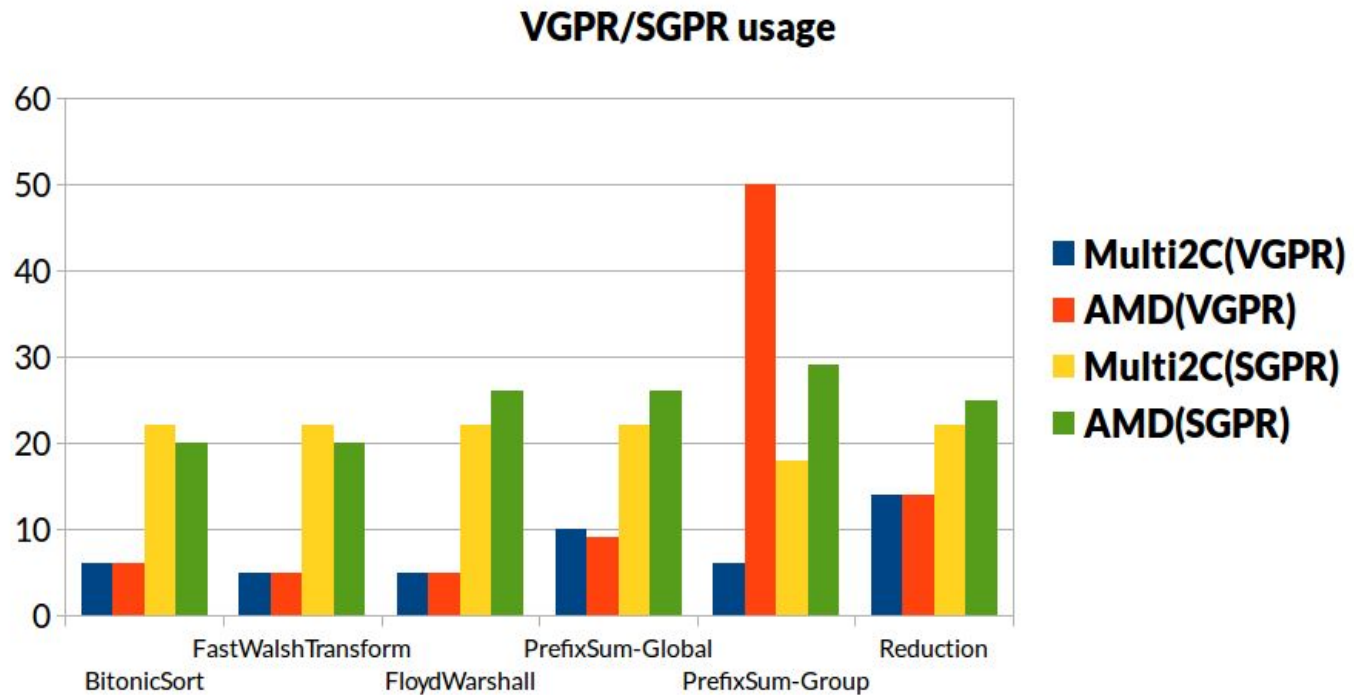
Level 2 : Applications and benchmarks



# What?

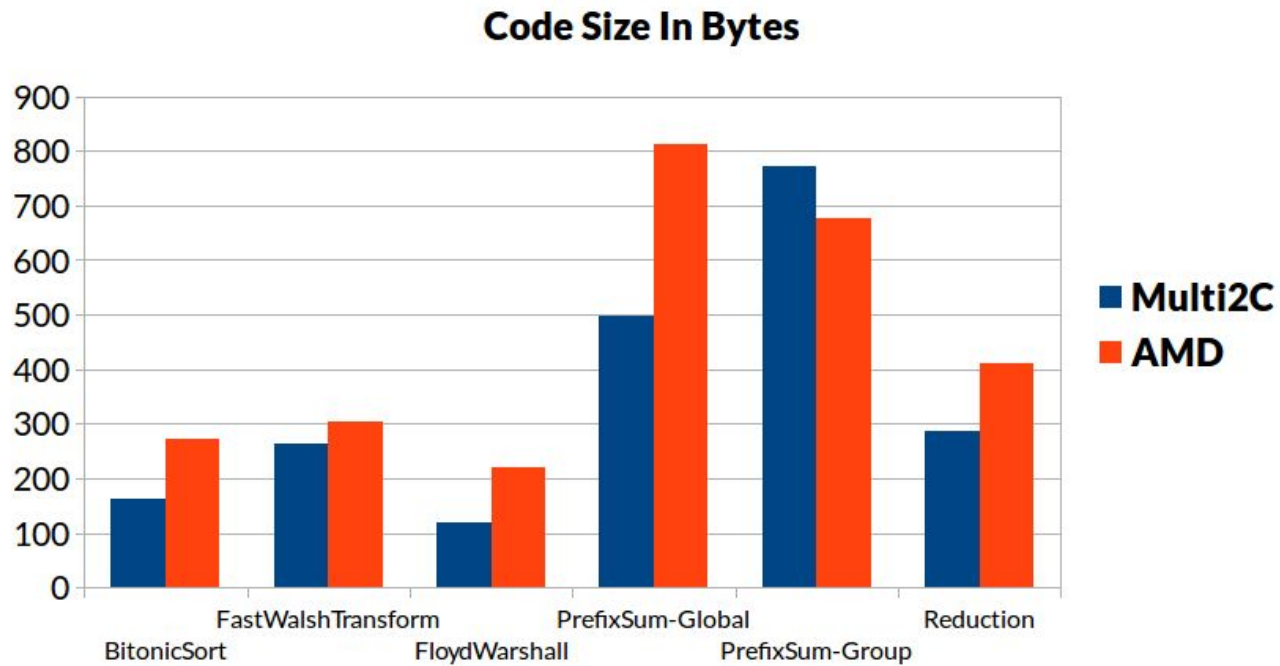
## Open vs Proprietary:

GPRs:



# What?

Code size in bytes



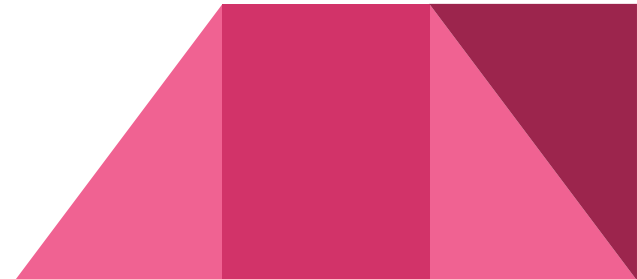
# Conclusion

An open source GPU compiler for Multi2Sim simulation framework

A testing suite for all OpenCL compiler

Comparable or better code generation

Work in progress, more to come





Thank you!

