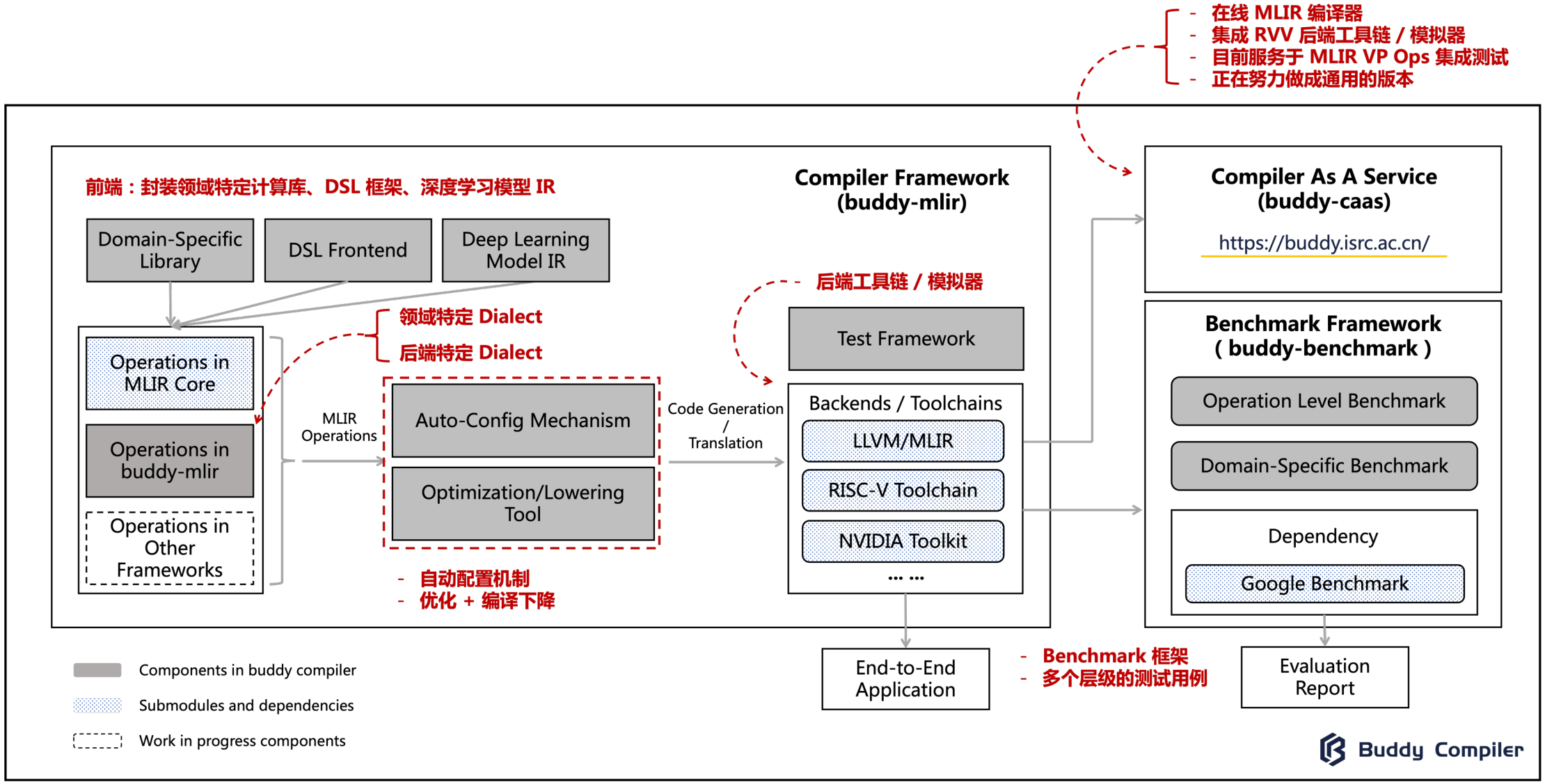
Buddy Compiler
概述、应用、后端支持

张洪滨 | hongbin2019@iscas.ac.cn

Buddy Compiler

Buddy Compiler 概述

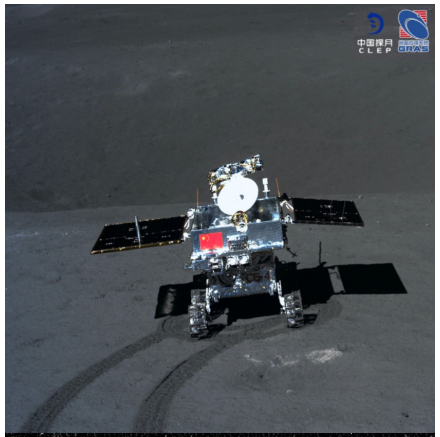


https://github.com/buddy-compiler

应用示例

Buddy Compiler

Image Processing

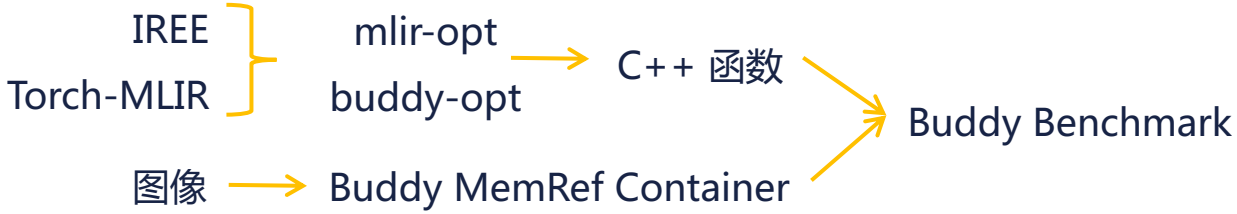


图像卷积
5x5 Sobel Kernel [1]

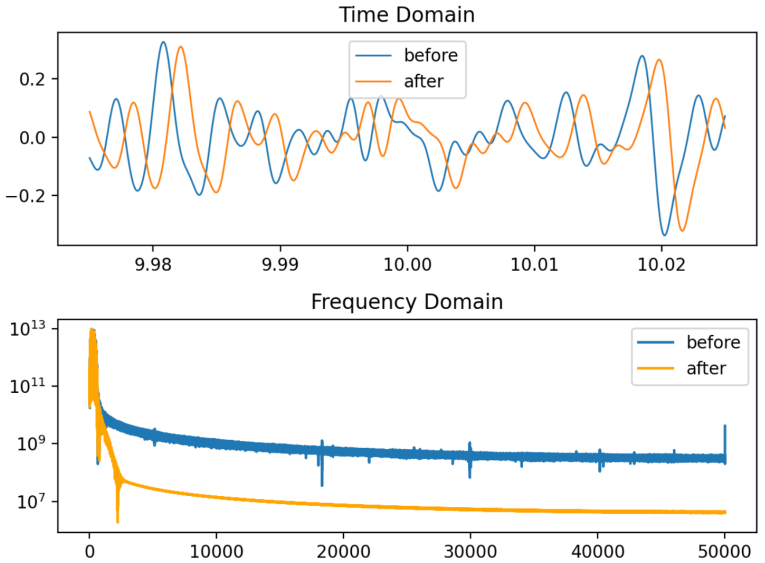
Deep Learning

```
Classification: Samoyed
Probability: 0.529544
```

图像识别：MobileNet-V3 [2]



Audio Processing

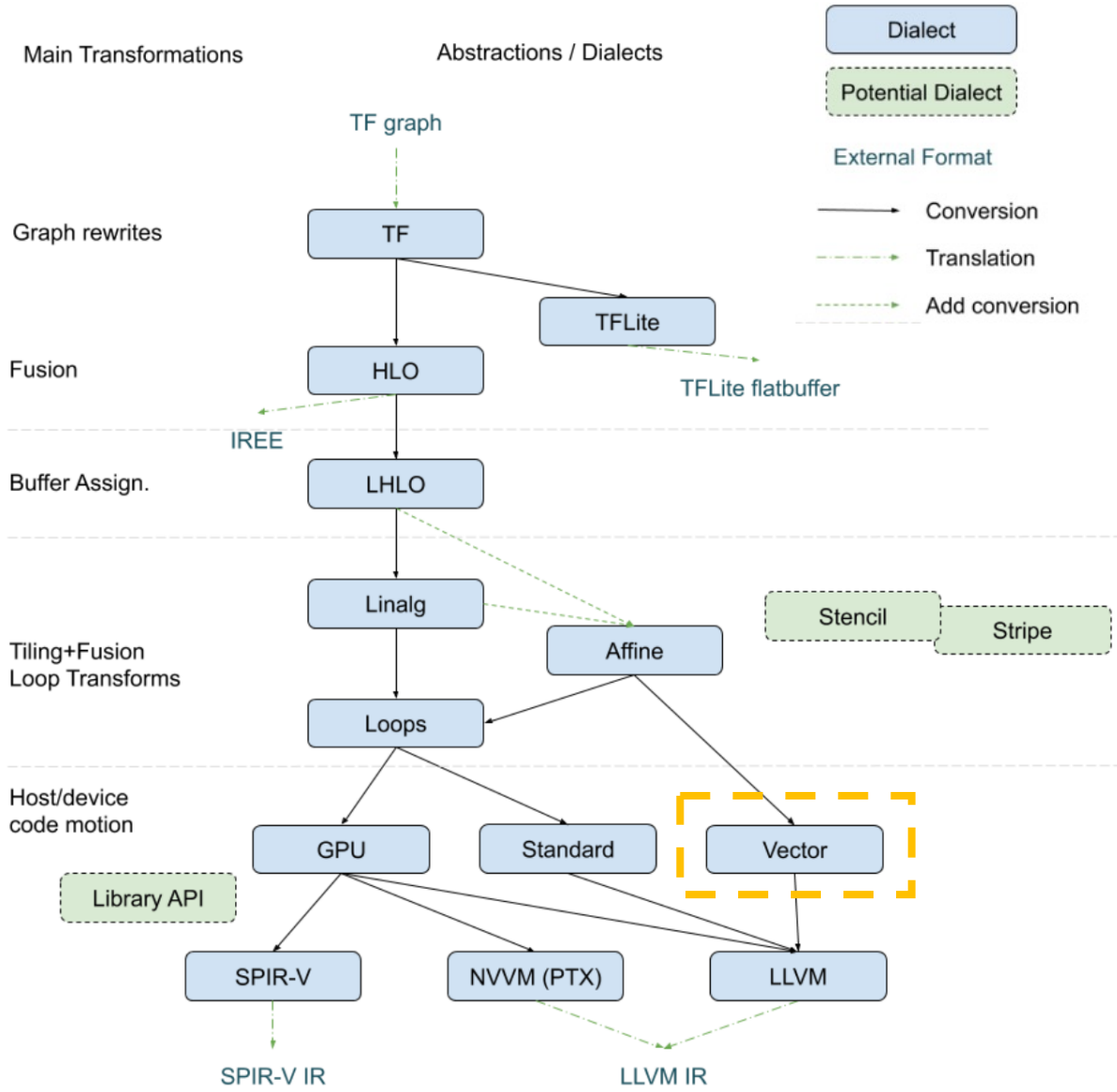


音频滤波 [3]

[1] The origin image is from China ‘s Lunar and Deep Space Exploration - http://www.clep.org.cn/
The image edge detection example is from buddy-benchmark - https://github.com/buddy-compiler/buddy-benchmark#image-processing-benchmark
[2] The image classification example is from buddy-benchmark - https://github.com/buddy-compiler/buddy-benchmark#deep-learning-benchmark
[3] The origin audio is from NASA ‘s recording of sound on Mars - https://www.nasa.gov/connect/sounds/index.html

MLIR RVV 后端支持

Buddy Compiler

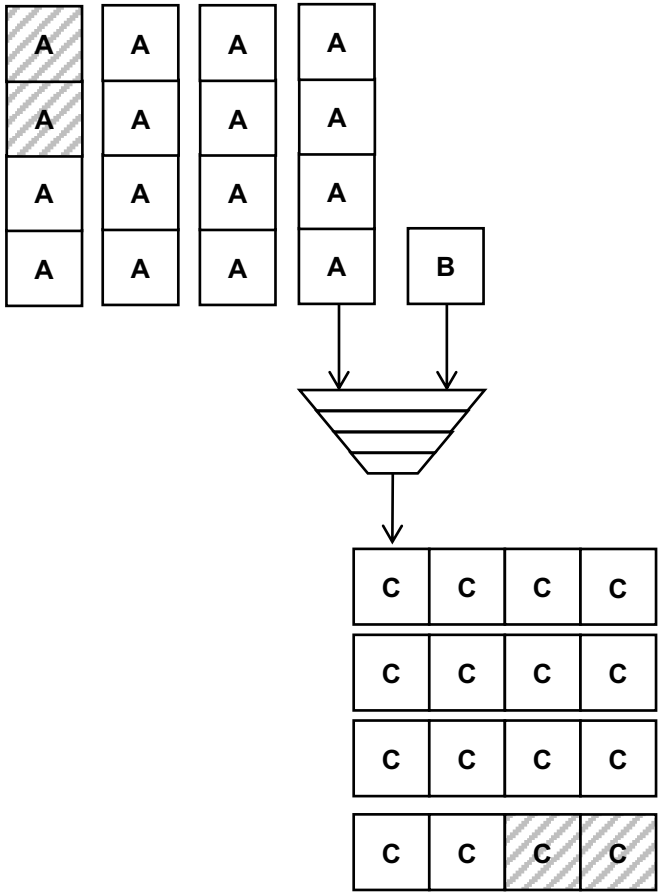


MLIR Lowering Paths - https://mlir.llvm.org/docs/Dialects/Vector/

MLIR RVV 后端支持

Buddy Compiler

Mask-Based Approach vs Strip-Mining Approach



vector<4xf32>

AVL = 4 | LMUL = 1 | SEW = 32

Suppose for both sides:

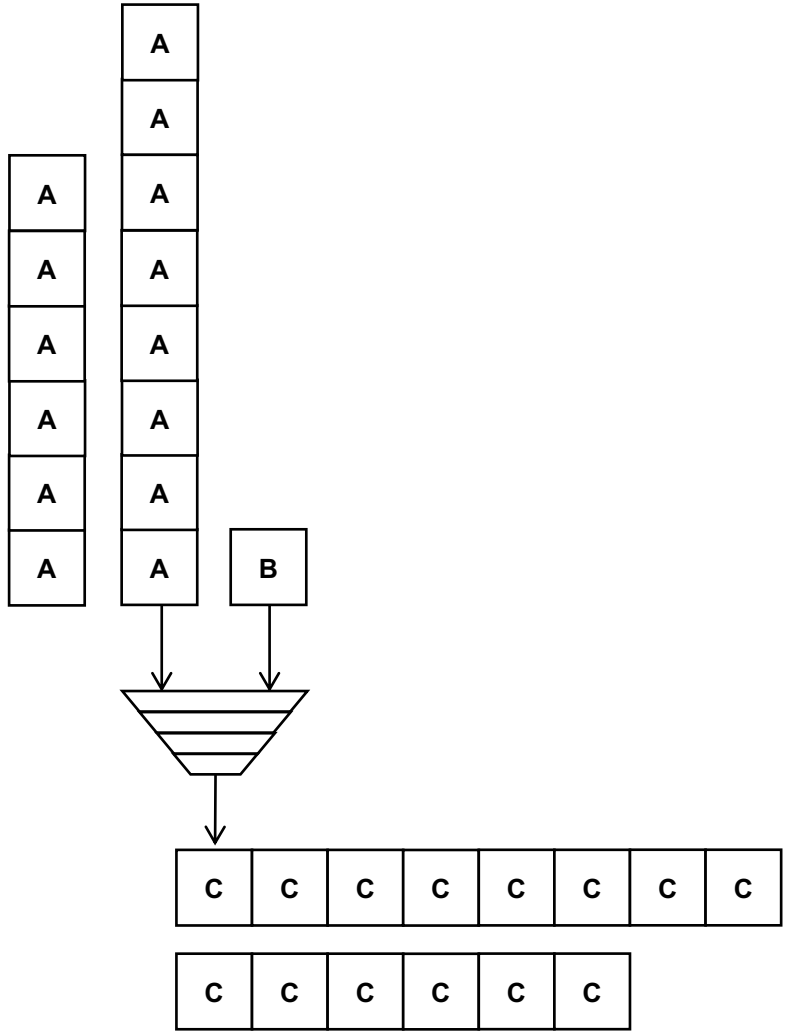
AVL = 14

SEW = 32

VLEN = **128**

2x processor frontend overhead

2x pipeline start-up overhead



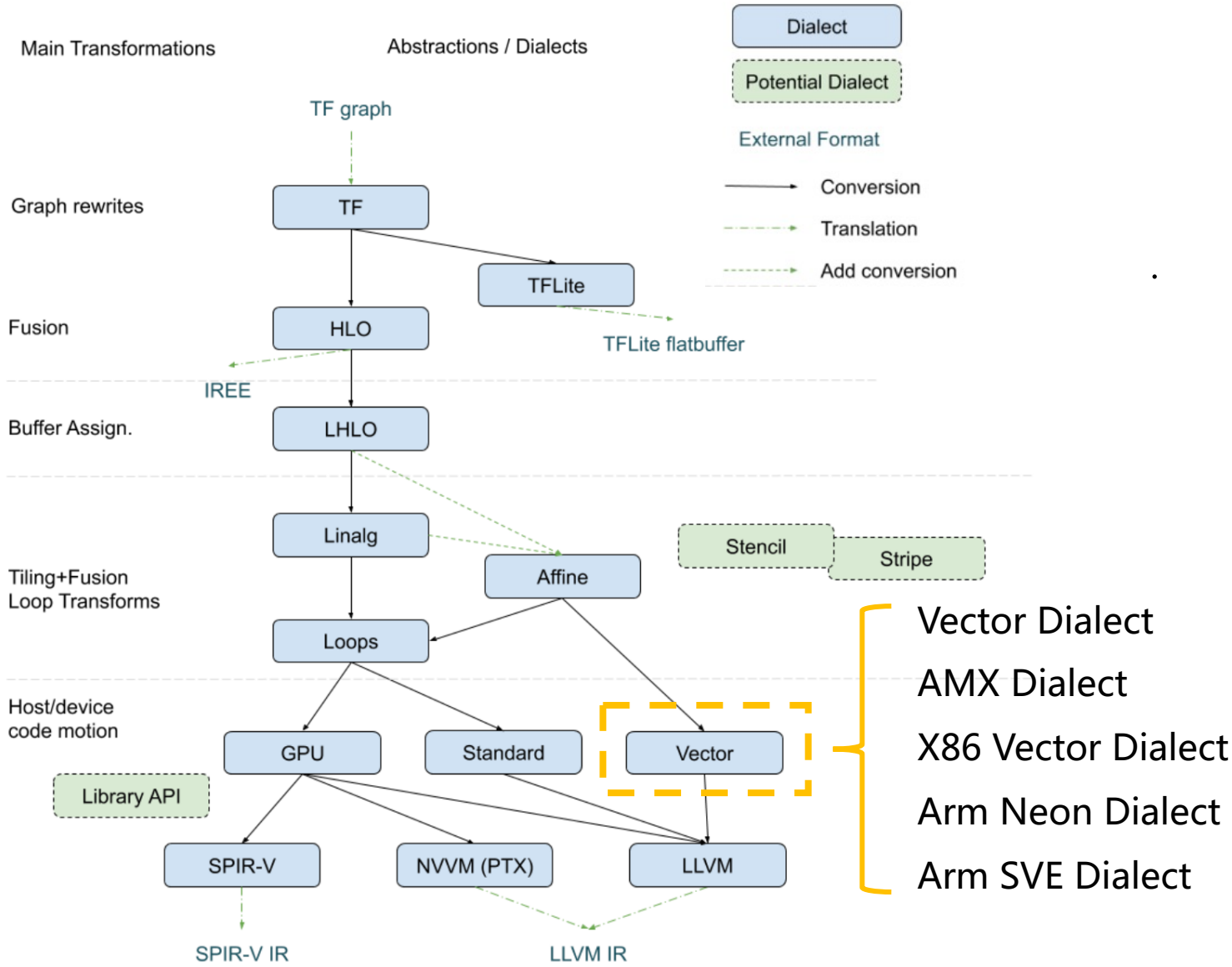
vector<[4]xf32>

~~AVL = 14~~ | LMUL = 2 | SEW = 32

MLIR 不支持动态设定向量长度

MLIR RVV 后端支持

Buddy Compiler



- Vector Dialect
- AMX Dialect
- X86 Vector Dialect
- Arm Neon Dialect
- Arm SVE Dialect

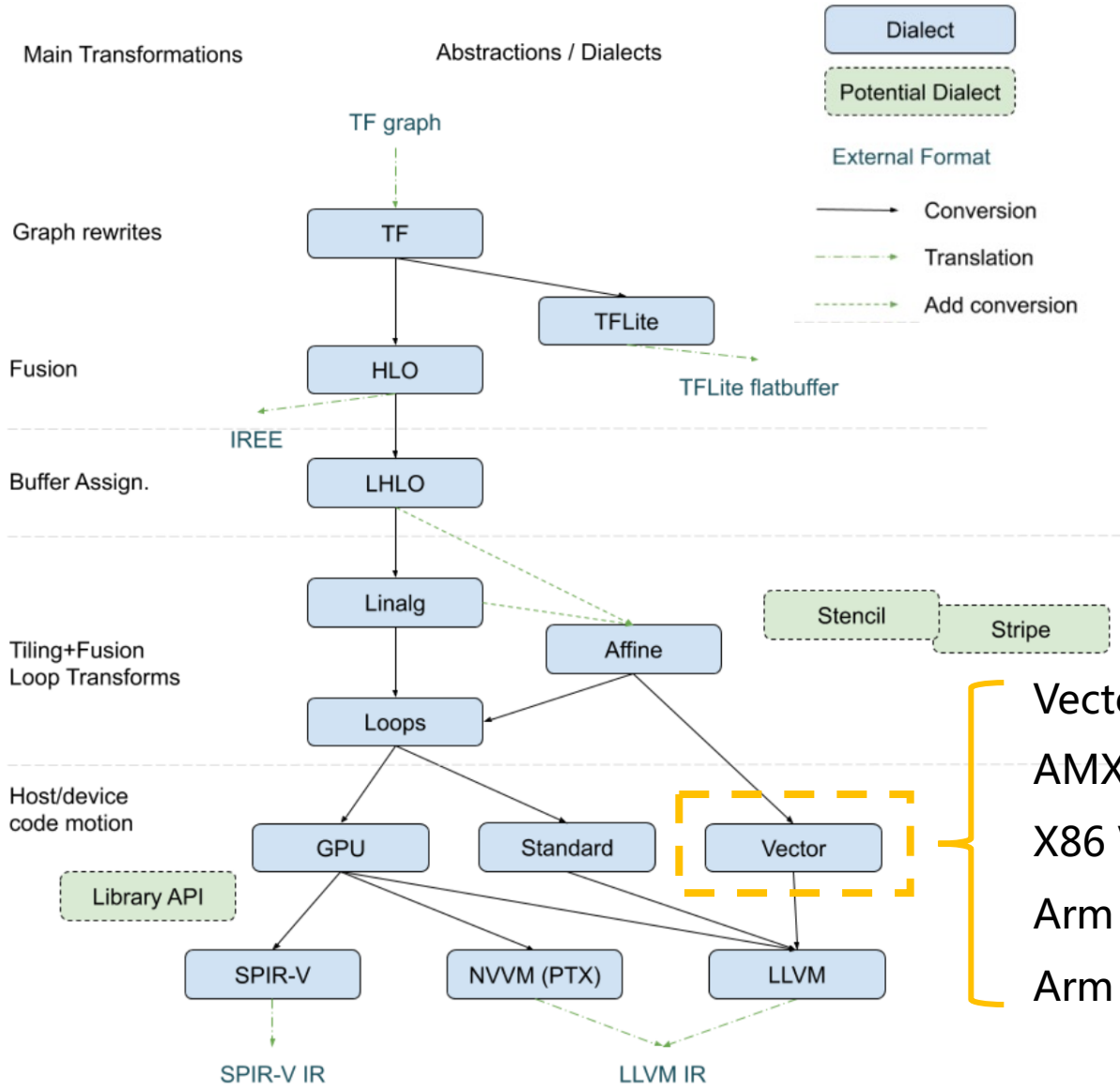
MLIR RISC-V Vector Dialect RFC

- Operation
  - RVV Operation
  - RVV Intrinsic Operation
- Type
  - Scalable Vector Type
- Conversion/Translation
  - RVV Dialect
  - LLVM Dialect
  - LLVM IR
- Integration Test

MLIR Lowering Paths - https://mlir.llvm.org/docs/Dialects/Vector/

MLIR RVV 后端支持

Buddy Compiler



- 碎片化趋势
- 将特性进行抽象

Vector Dialect
AMX Dialect
X86 Vector Dialect
Arm Neon Dialect
Arm SVE Dialect

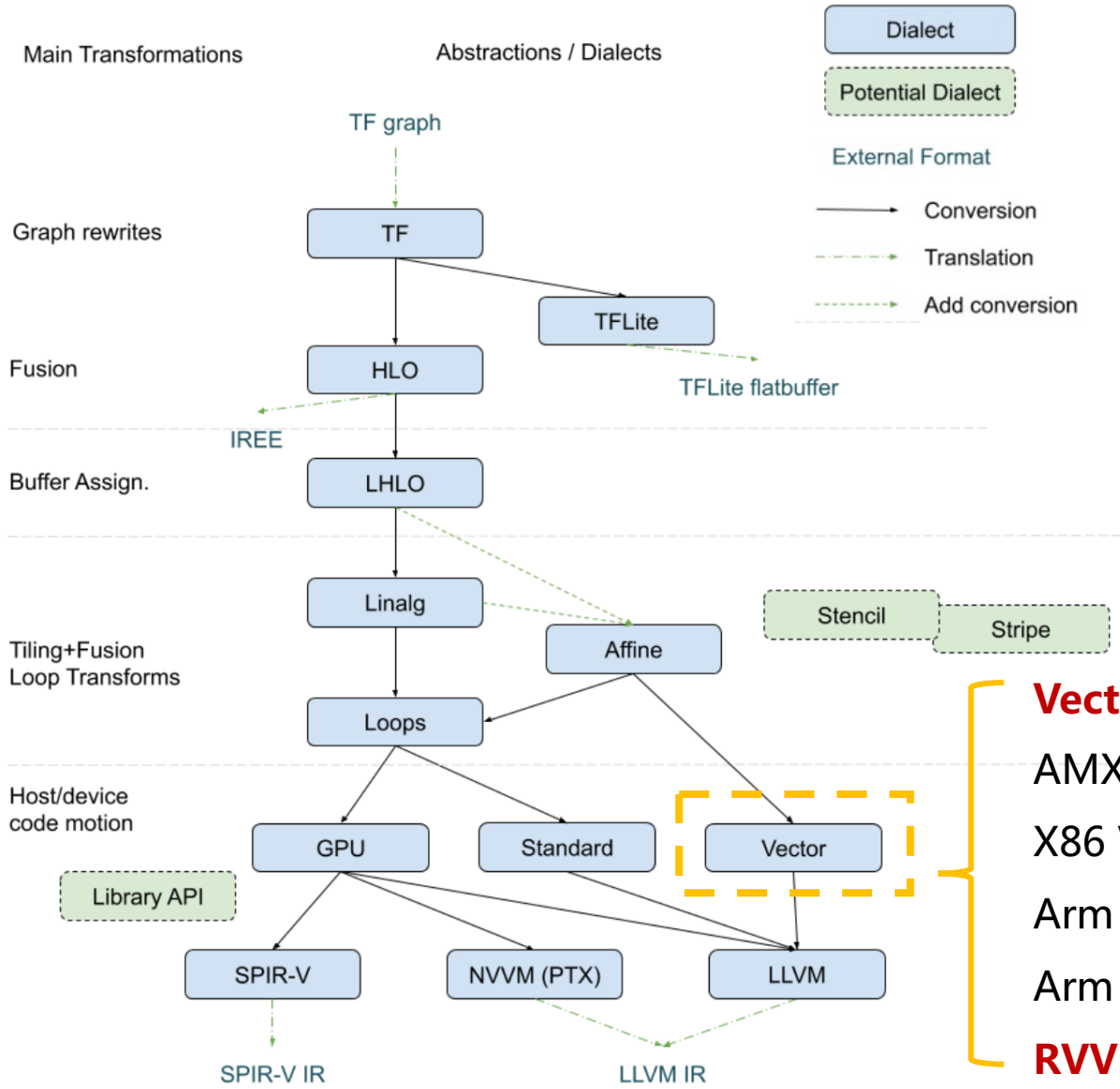
MLIR RISC-V Vector Dialect RFC

- Operation
  - RVV Operation
  - RVV Intrinsic Operation
- Type
  - Scalable Vector Type (Upstream)
- Conversion/Translation
  - RVV Dialect
  - LLVM Dialect
  - LLVM IR
- Integration Test

MLIR Lowering Paths - https://mlir.llvm.org/docs/Dialects/Vector/

MLIR RVV 后端支持

Buddy Compiler



Update / WIP

- 使用 VP Intrinsic 提高通用性
- 测试 VP Intrinsic 后端完备性
- 在 Vector Dialect 中支持动态 VL
- 寻找 RVV 特定热点指令在 RVV Dialect 中支持

Vector Dialect ⟶ **添加动态向量长度的抽象支持**

AMX Dialect

X86 Vector Dialect

Arm Neon Dialect

Arm SVE Dialect

RVV Dialect ⟶ **添加 RVV 特定热点指令的抽象支持**

MLIR Lowering Paths - https://mlir.llvm.org/docs/Dialects/Vector/

Buddy Compiler

谢 谢！

hongbin2019@iscas.ac.cn