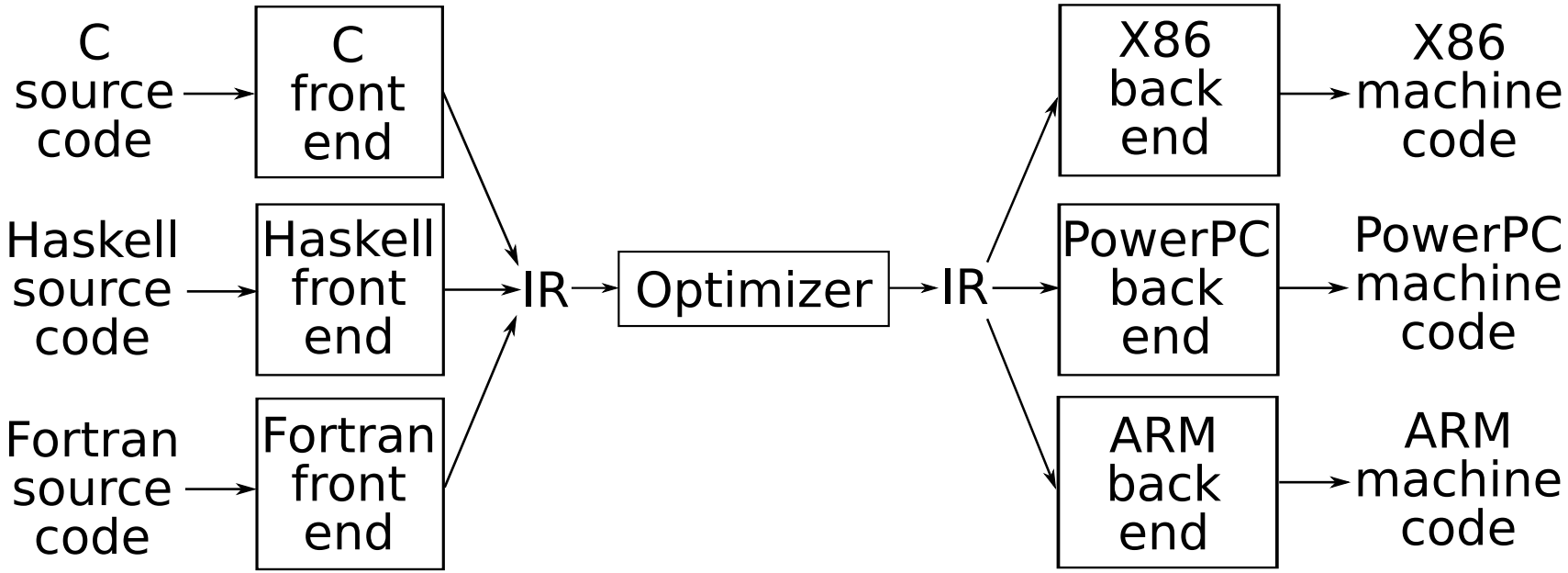
Today's Plan

1. LLVM case study (Laura)
2. Audacity case study (Wei)
3. Discussion in your project groups
4. Discussion with the group beside you

Survey

- How many people have finished CS 444?
- How many people are currently in CS 444?
- How many people have heard of LLVM?

Ideal Compiler Architecture



Does Anyone Use This Architecture?

- Sort of...
  1. Java and .NET have well defined bytecode
  2. GCC supports many languages and target architectures but lacks clean interfaces

Enter LLVM

- Language agnostic compiler infrastructure
- Uses ideal architecture: IR is the only interface to the optimizer
- Acronym is meaningless

Example of LLVM IR

```
unsigned add1(unsigned a, unsigned b) {
  return a+b;
}

define i32 @add1(i32 %a, i32 %b) {
entry:
  %tmp1 = add i32 %a, %b
  ret i32 %tmp1
}
```

Adding a New Optimization Pass

- LLVM is written in C++
- Every optimization is a subclass of the `Pass` class
- Just make a new class!

What Lessons Can We Learn?

- Clean architecture: not just for academics
- Modularity makes it easier to:
  - Add or rewrite components
  - Test components
  - Reduce your workload by reusing components

Applying The Lessons to Your Project

- Have you thought about your architecture yet?
- Is it modular?