Advanced Topics in Compilers

SCCManager

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Outline

• What is it and why NOELLE provides it

• SCC and its metadata
SCCManager

• It provides information/knowledge/semantics about a given SCC of a loop dependence graph

• Such semantics can be used to create degrees of freedom about satisfying the constraints dictated by the dependences included in an SCC

```cpp
/*
 * Dependences.
 */
auto sccManager = loop->getSCCManger();
```

Instance of the class `llvm::noelle::LoopDependenceInfo`

Instance of the class `llvm::noelle::SCCDAGAttrs`
SCC and its metadata

For every SCC in an SCCDAG, there is an instance of the class `llvm::noelle::GenericSCC` that describes the semantics of such SCC.

```cpp
/*
 * Dependences.
 */
auto sccManager = loop->getSCCManager();
auto SCCDAG = sccManager->getSCCDAG();

/*
 * Check all SCCs.
 */
for (auto scc : SCCDAG->getSCCs()){
8 lines: Print the instructions that...
}

/*
 * Fetch the SCC information.
 */
auto sccInfo = sccManager->getSCCAtrs(scc);

Instance of the class `llvm::noelle::GenericSCC`
Outline

• What is it and why NOELLE provides it

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Instance of the class `llvm::noelle::GenericSCC`

```cpp
/*
 * Fetch the SCC information.
 */
auto sccInfo = sccManager->getSCCAattrs(scc);

/*
 * Check the SCC type
 */
if (isa<LoopCarriedSCC>(sccInfo)) {
  if (isa<ReductionSCC>(sccInfo)) {
    errs() << " It can be reduced\n";
  } else if (isa<LoopCarriedUnknownSCC>(sccInfo)) {
    errs() << " We don't know how to avoid executing this SCC sequentially\n";
  } else {
    auto liSCC = cast<LoopIterationSCC>(sccInfo);
    errs() << " It doesn't have loop-carried dependences\n";
  }
}
```
Instance of the class `llvm::noelle::GenericSCC`

```cpp
/**
 * Fetch the SCC information.
 */
auto sccInfo = sccManager->getSCCAttrs(scc);
```

Instance of the class `llvm::noelle::ReductionSCC`

```cpp
if (auto redSCC = dyn_cast<ReductionSCC>(sccInfo)){
    /*
     * Use the APIs of this specific SCC.
     */
    errs() << " Identity value = " << redSCC->getIdentityValue() << "\n";
    errs() << " PHI accumulator = " << redSCC->getPhiThatAccumulatesValuesBetweenLoopIterations() << "\n";
}
```
Always have faith in your ability

Success will come your way eventually

Best of luck!