Static Single Assignment

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Recap: What is SSA

• What is **SSA**?
  • SSA is a rule which states that **each variable can be assigned more than once in the program text**.
Recap: Three Algorithms

• Dominance Frontier
• $\varphi$ Placement
• Variable Renaming
Dominance Frontier
Dominance Frontier

• What are the definitions of Dominance Frontier?
Dominance Frontier in LLVM

- Implemented in `llvm/Analysis/DominanceFrontierImpl.h` (line 160) using worklist algorithm.

- Has a wrapper pass that can be used as a prerequisite for other passes (needs to be specified inside `AnalysisUsage`).
  - There is also similar wrapper pass for Dominator Tree: `DominatorTreeWrapperPass`
φ Placement
$\varphi$ Placement

• Where should we place $\varphi$?
  • $i$?
  • $j$?
  • $k$?
Rename Variables
Rename Variables

- Traverse through the CFG, and rename variables as we go.