LLVM & HPSSA

Hot Path SSA Form in LLVM

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What we modified in LLVM?

- New `llvm::intrinsic` signature, `"llvm.tau"`.
- Modified `Verifier::verifyDominatesUse()` since we don't want our intrinsic to interfere with `dominators` computation.

HPSSAPass : Overview

- New `llvm::HPSSAPass` pass using the new Pass Manager.
- Pass runs over a `llvm::Function` and inserts `"llvm.tau"` intrinsic calls with speculative and safe arguments.

Key HPSSA Data Structures :

- Hot Path Set using `llvm::BitVector`.
- Definition Accumalator, `defAccumalate` as a map `std::map<{PHINode*,BasicBlock*}, {Value*,BitVector}>`.
- Variable Renaming Stack as a map, `std::map<Value*,Value*>`

HPSSAPass : Auxilliary Functions

- `HPSSAPass::getProfileInfo(Function \&F)`
- `HPSSAPass::getCaloricConnector(Function \&F)`
- `HPSSAPass::Search(BasicBlock \&BB, DomTreeNode \&DTN`

HPSSAPass : Main & Destruction Pass

- `HPSSAPass::run(Function \&F, FunctionAnalysisManager \&AM)`
- `llvm::Function::RPOT()`.
- `llvm::successors()`.
- `llvm::DominatorTreeAnalysis` and `llvm::dominates()`.
- Replace use of `phi's` with `tau` variables using `renaming` stack.
- Out of HPSSA Form.

SSCCP Pass

LLVM Changes

SSCCP with an Example