

Quick start: LLVM compiler framework

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Introduction

LLVM framework quick start

Understanding LLVM

LLVM is not a compiler.

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LLVM is a collection of
components
which is useful to build a
compiler.

Getting LLVM

- ▶ “old” git mirrors
 - ▶ only llvm repo (subprojects in separated repos, can be added later)
 - ▶ `git clone -b release_80 --single-branch
git@github.com:llvm-mirror/llvm.git`
- ▶ “new” git monorepo
 - ▶ all in one repo (llvm + major subprojects)
 - ▶ `git clone -b release/8.x --single-branch
git@github.com:llvm/llvm-project.git`

What LLVM is made of

- ▶ C++ libraries
 - ▶ `src/include/llvm/...`
 - ▶ `src/lib/...`
- ▶ small application (tools)
 - ▶ `src/tools/...`
 - ▶ `src/utis/...`

You can find binaries of them in the installation directory under `root/bin/...`

clang

- ▶ clang is a compiler based on LLVM
- ▶ It compiles all major C-like languages
- ▶ It is part of the git monorepo
- ▶ It can be added as a tool in the LLVM framework but must be manually cloned in the tool directory
 1. `cd src/tools`
 2. `git clone http://llvm.org/git/clang` (git mirror version)
- ▶ You can easily see on a production quality compiler the impact of changes you made on your local copy of LLVM

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Commands

llvm-as LLVM assembler

llvm-dis LLVM disassembler

opt LLVM optimizer

llc LLVM static compiler

lli directly execute programs from LLVM bitcode

llvm-link LLVM bitcode linker

llvm-mca LLVM machine code analyzer

llvm-nm list LLVM bitcode and object file's symbol table

llvm-stress generate random .ll files

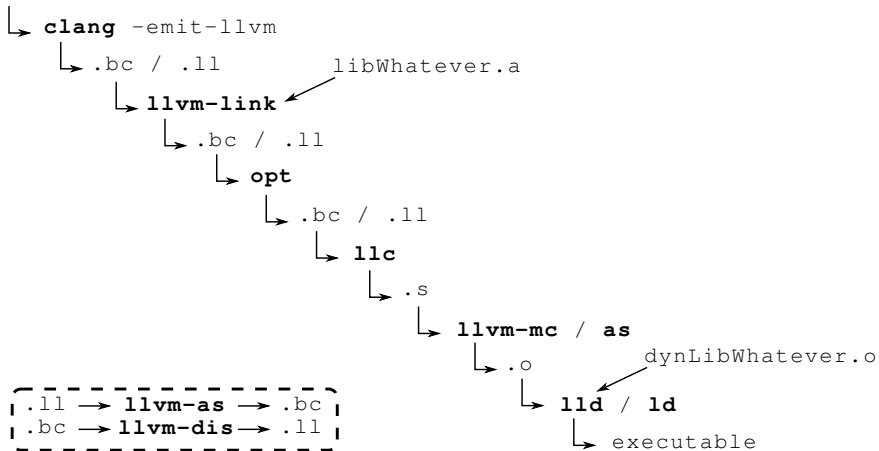
llvm-config prints out install configuration parameters

llvm-dwarfdump print contents of DWARF sections

For a complete reference, see LLVM command guide ¹

¹<http://llvm.org/docs/CommandGuide/index.html>

.c source



Writing a LLVM pass

There are a lot of tutorials available:

- ▶ Official developer guide

llvm.org/docs/WritingAnLLVMPass

- ▶ Out-of-source pass

github.com/quarkslab/llvm-dev-meeting-tutorial-2015

We will follow the first one, with a few adjustments.

Testing

LLVM has an internal testing infrastructure.² Please use it.

llvm-lit LLVM Integrated Tester

1. Forge a proper LLVM-IR input file (.ll) for your test case
2. Instrument it with `lit` script comments
3. Run `lit` on your test
 - ▶ `llvm-lit /llvm/test/myTests/singleTest.ll`
run a single test
 - ▶ `llvm-lit /llvm/test/myTests`
run the test suite (folder)
4. Run `lit` on the LLVM test suite (regression testing)

To submit a bug report to LLVM developers you will be asked to write a `lit` test case that highlights the bug.

²<http://llvm.org/docs/TestingGuide.html>