

Introduction to LLVM compiler framework

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Understanding LLVM

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

What LLVM is made of

- C++ libraries
 - `src/include/llvm/...`
 - `src/lib/...`

- small application (tools)
 - `src/tools/...`
 - `src/utils/...`

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 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`
- 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-lib` LLVM lib.exe compatible library tool

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

`llvm-config` Print LLVM compilation options

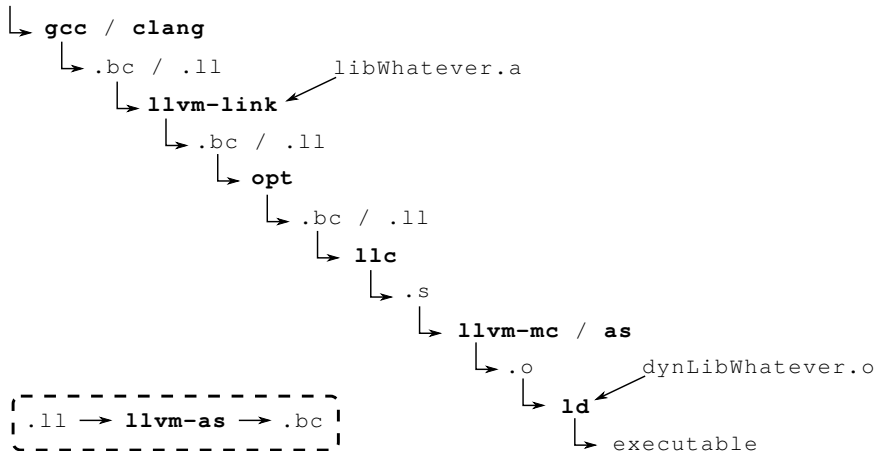
`llvm-stress` generate random .ll files

`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>