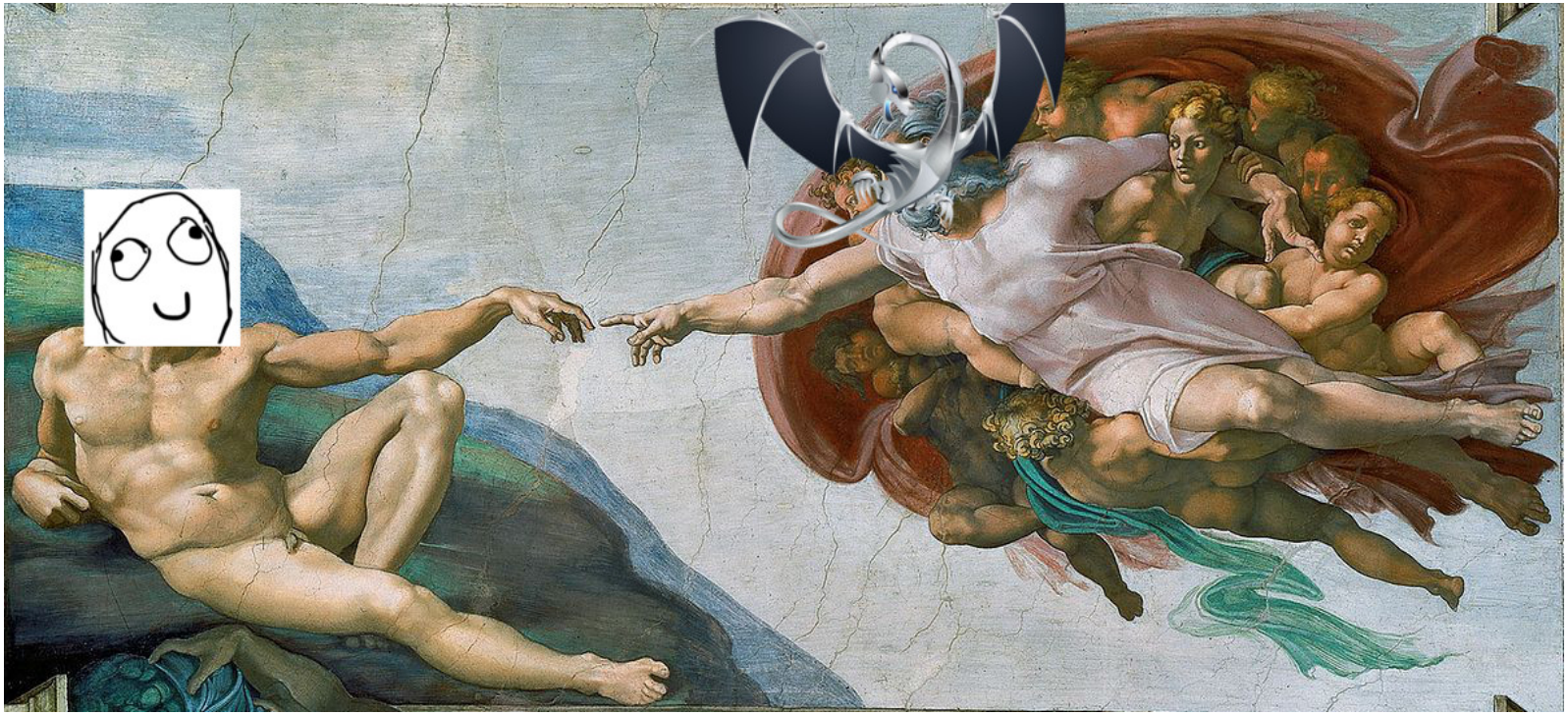
./clang-talk

Peter Goldsborough

May 20, 2017



Background

Background

TUFaceBloomGoogleStartupMIT

LLVM

LLVM

Low

LLVM

Low Level

LLVM

Low Level Virtual

LLVM

Low Level Virtual Machine

LLVM

~~Low Level Virtual Machine~~

LLVM

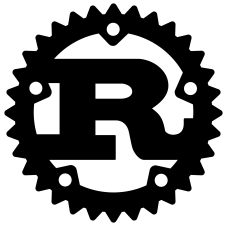
~~Low Level Virtual Machine~~

lldb opt lld lljvm

LLVM

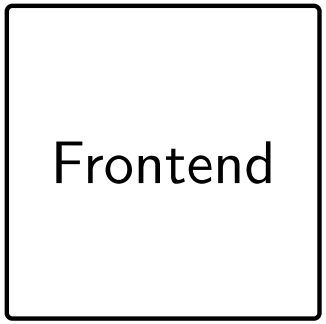
~~Low Level Virtual Machine~~






Compilers

Compilers



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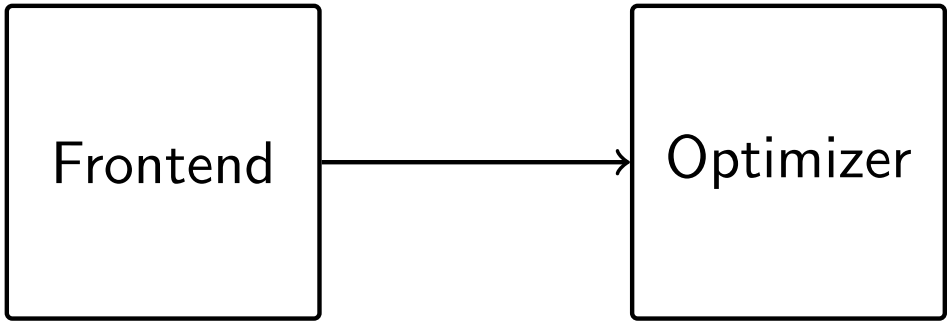

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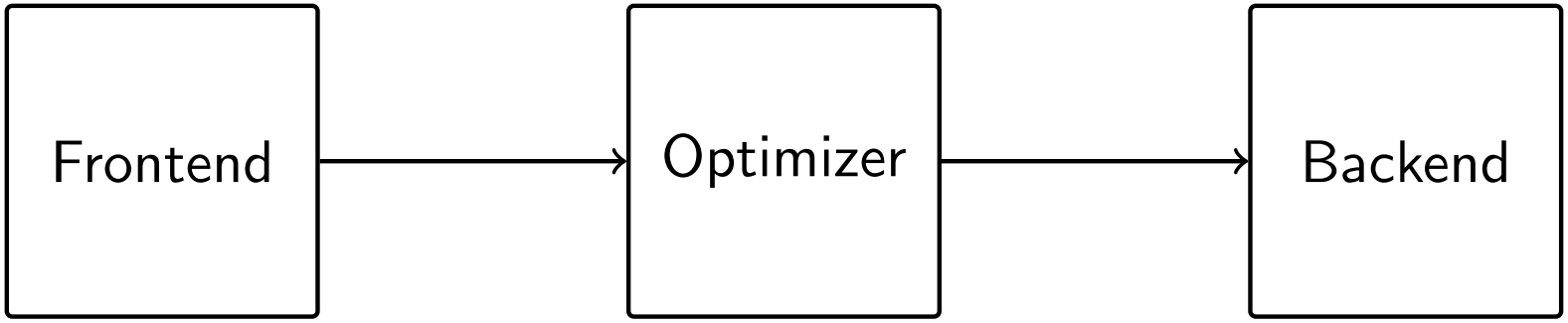

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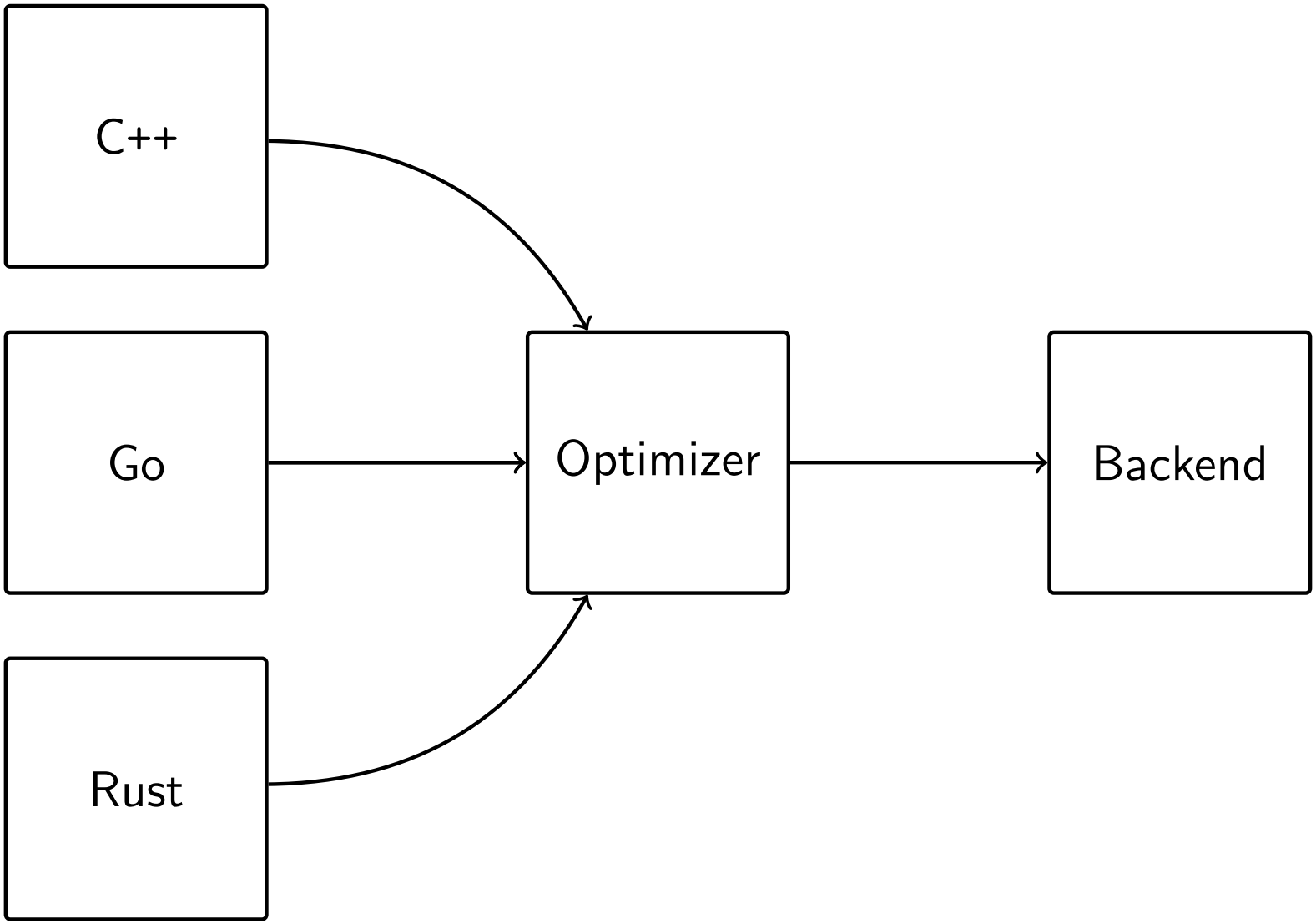

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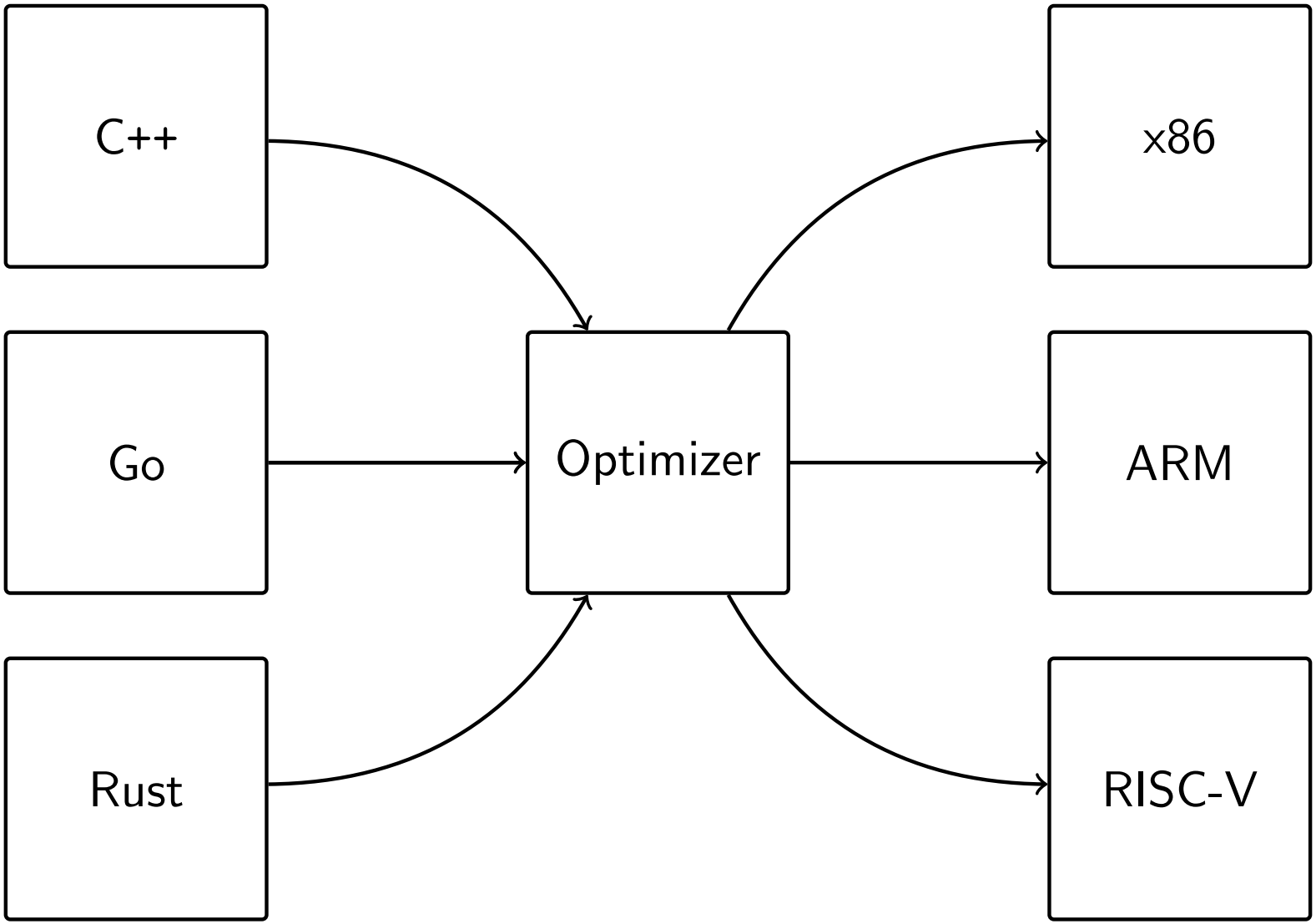
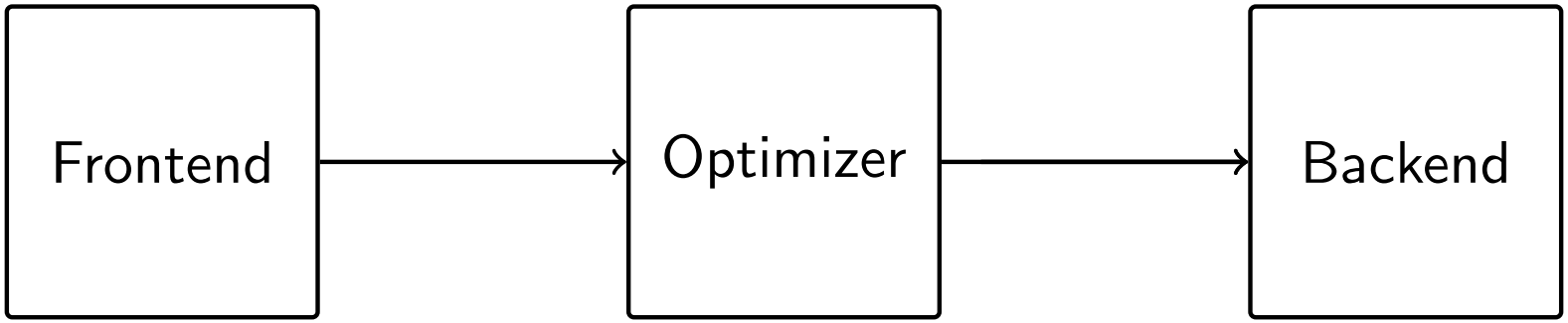


LLVM



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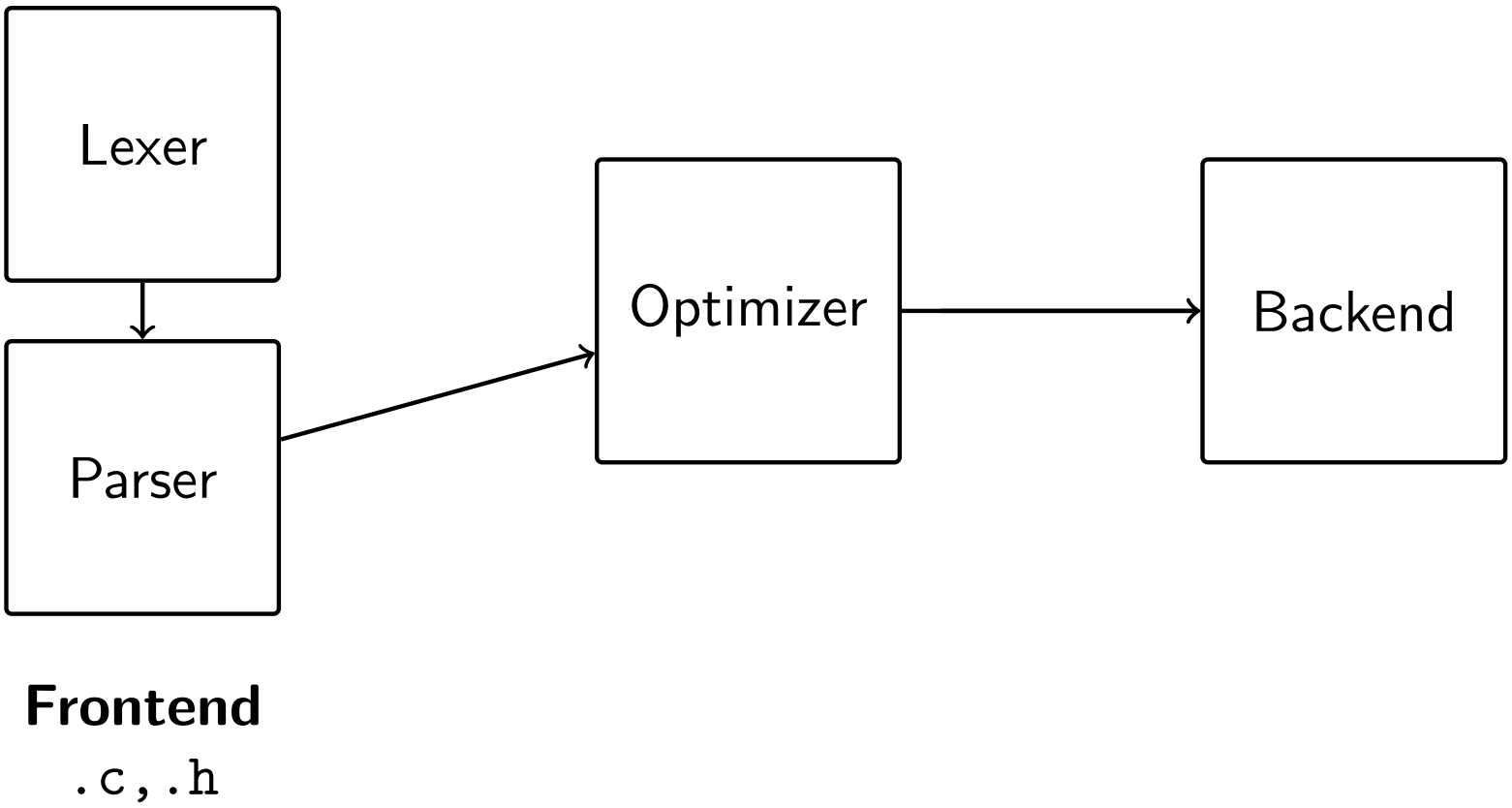

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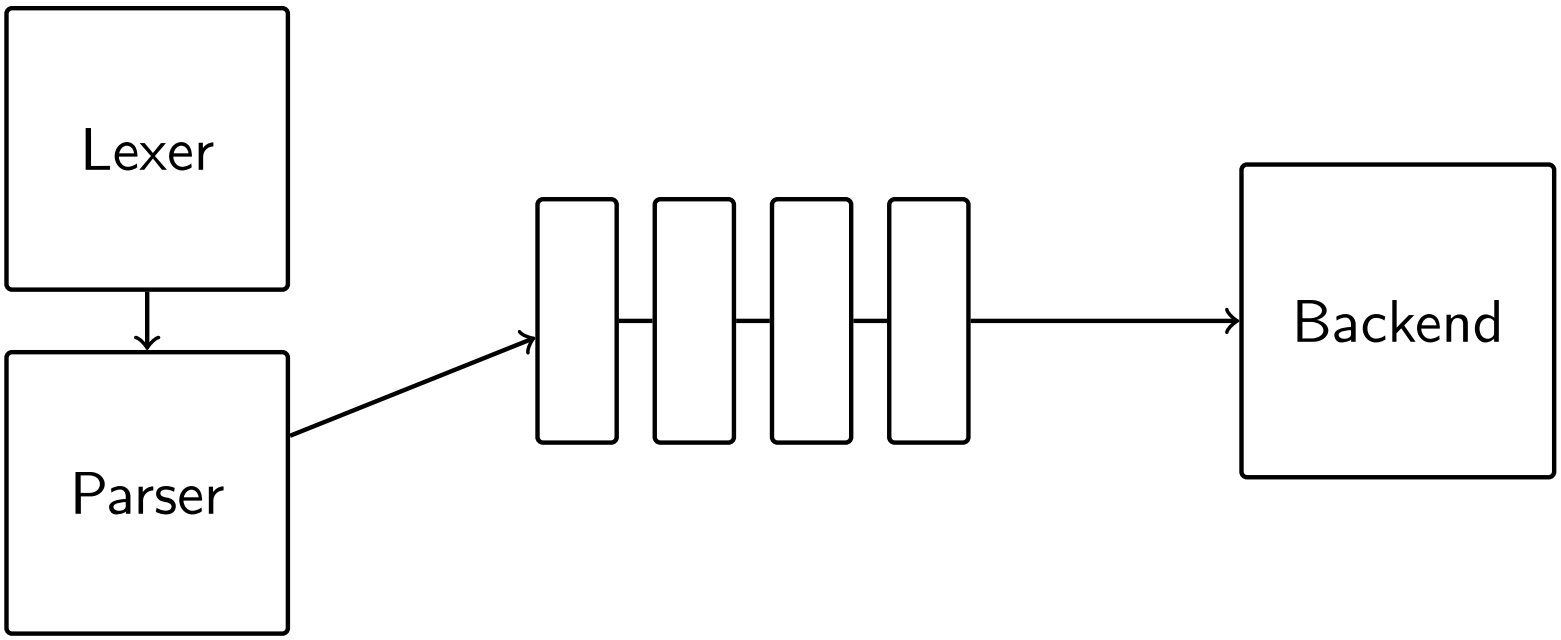
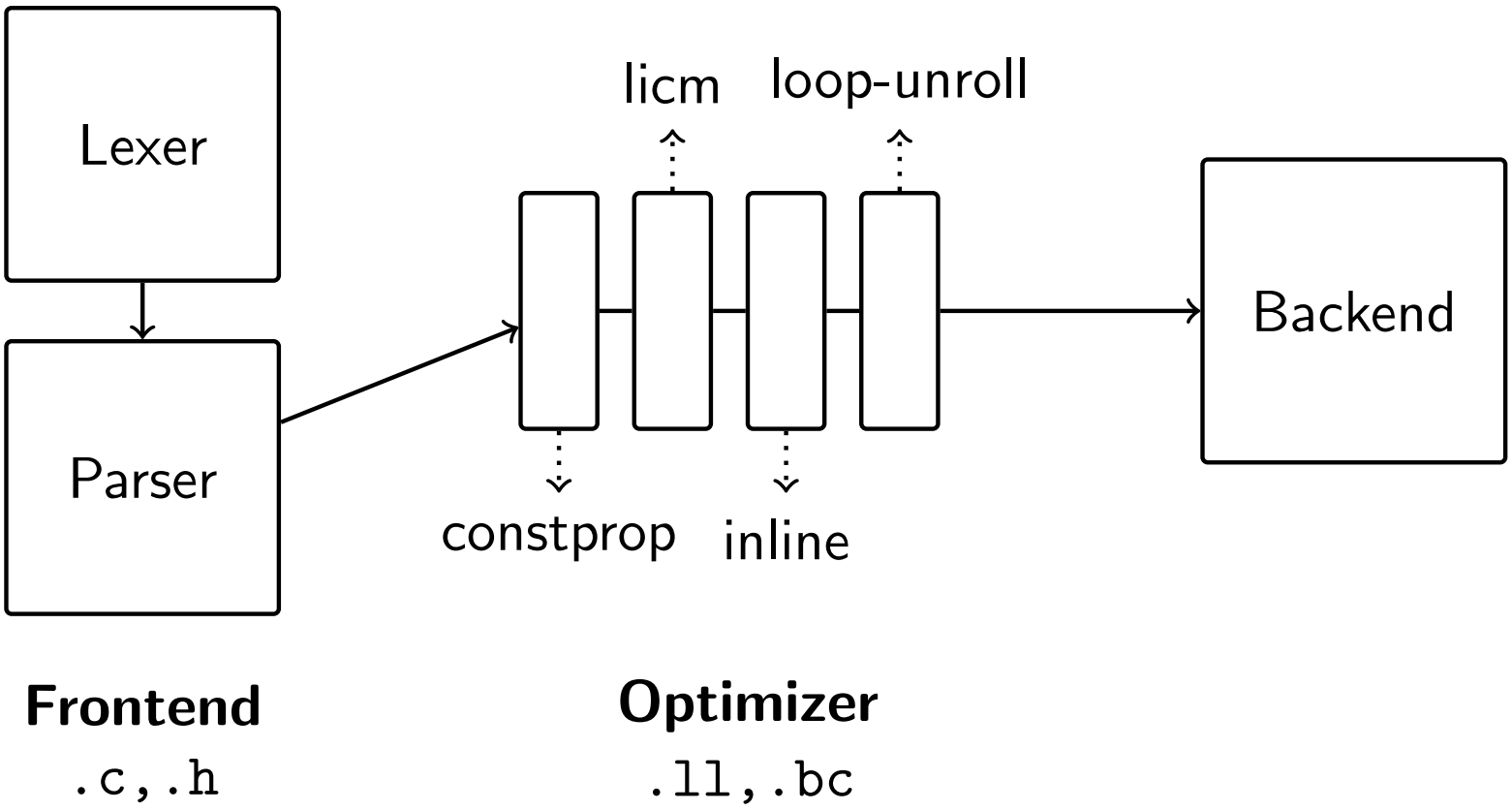


Frontend
`.c,.h`

Optimizer
`.ll,.bc`

LLVM


Lexer
Parser
licm
loop-unroll
constprop
inline
Backend
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.c,.h
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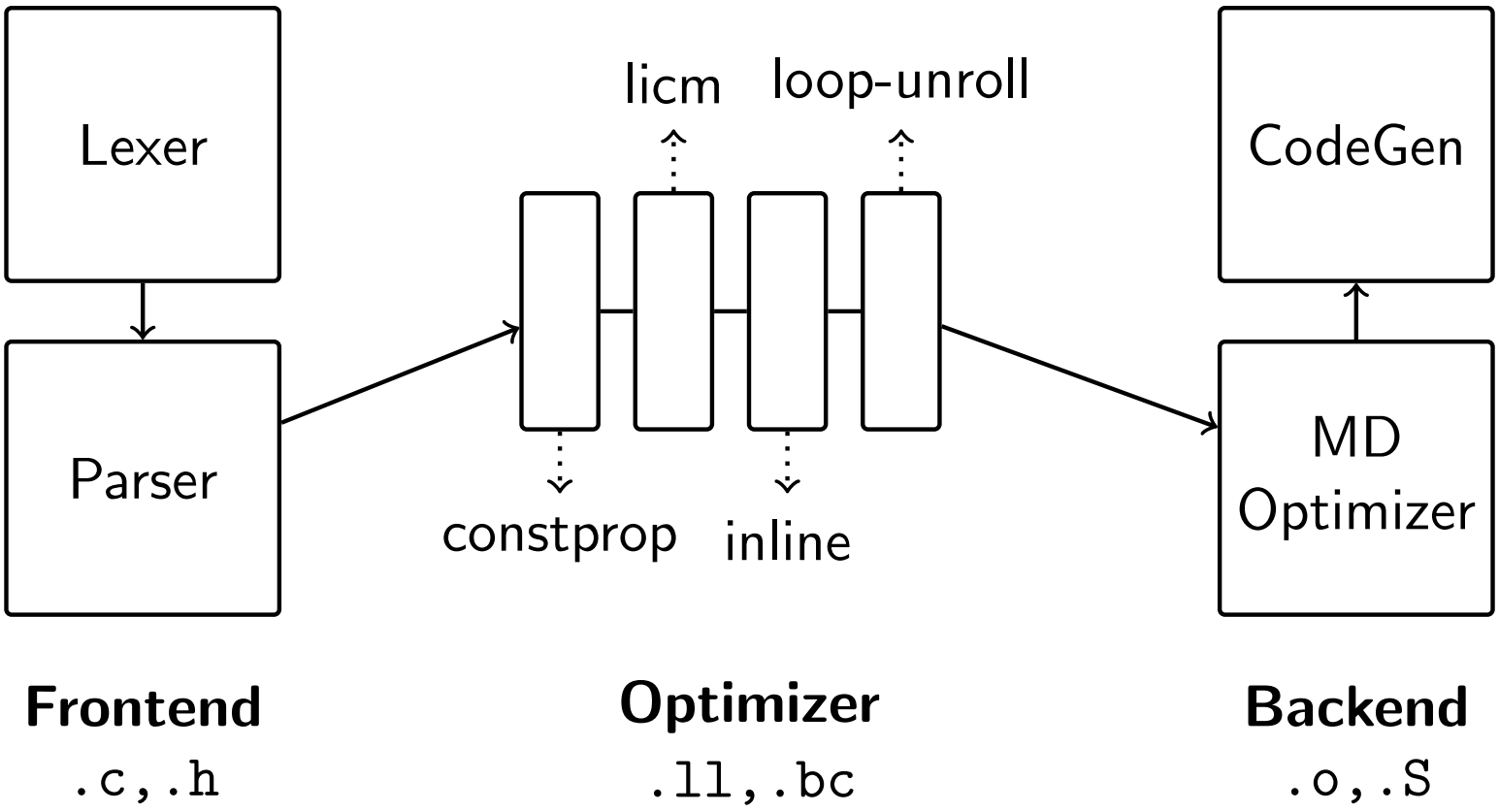
LLVM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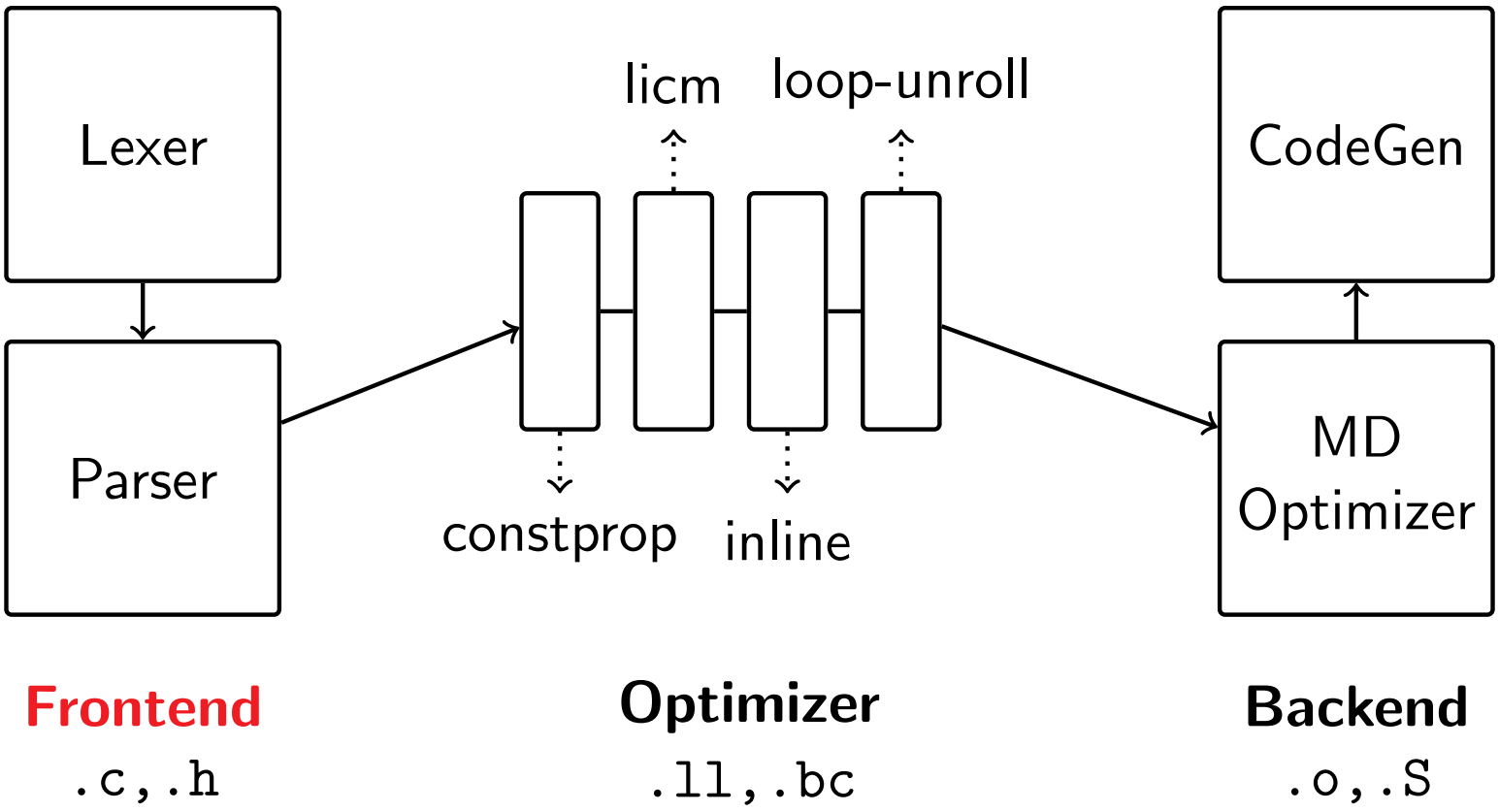
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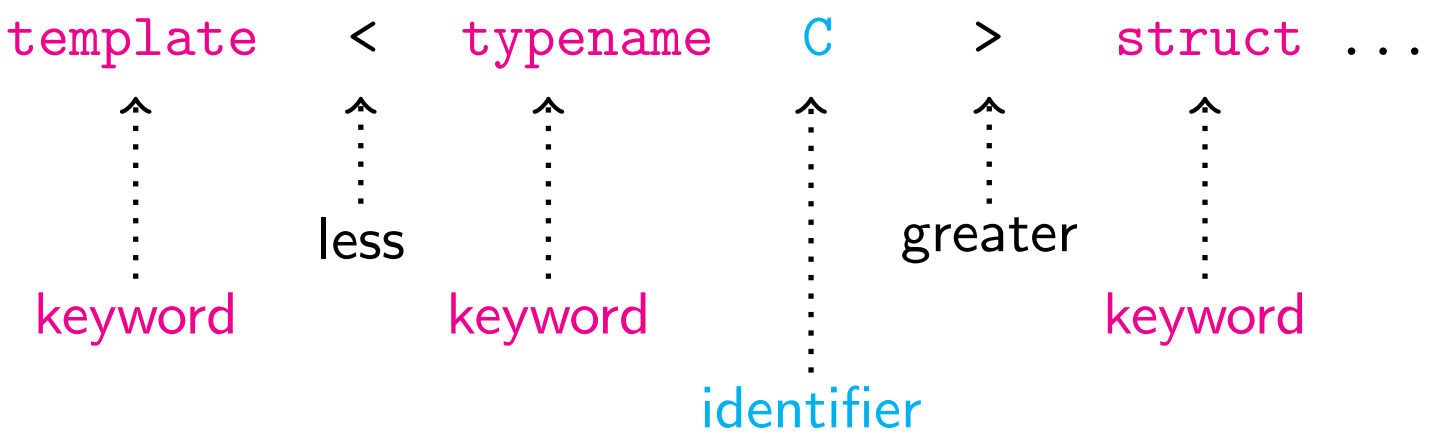
clang

```
template<typename C>
struct L {
  char a();
  void n(int) const;
  bool g;
};
```

Clang: Lexer

```
template < typename C > struct ...
```

Clang: Lexer


template
<
typename
C
>
struct ...
keyword
less
keyword
identifier
greater
keyword

Clang: Parser

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```
void n ( int arg = 42 ) const ;
```

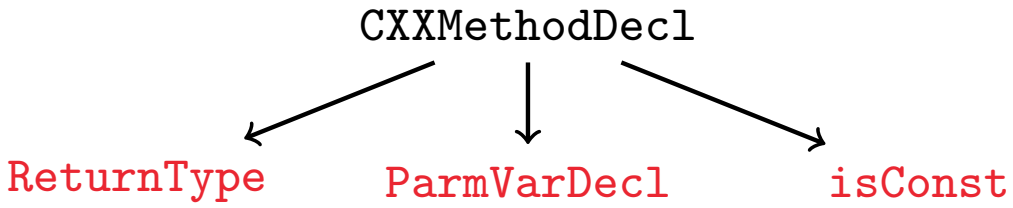
Clang: Parser

```
void n ( int arg = 42 ) const ;
```

CXXMethodDecl

Clang: Parser

```
void n ( int arg = 42 ) const ;
```



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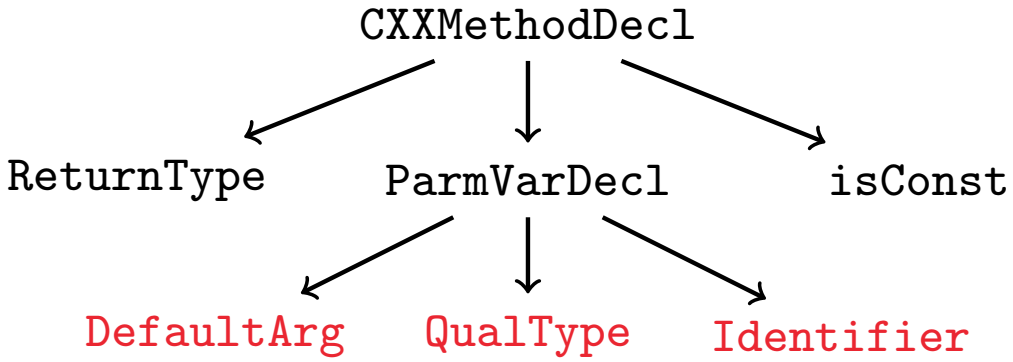

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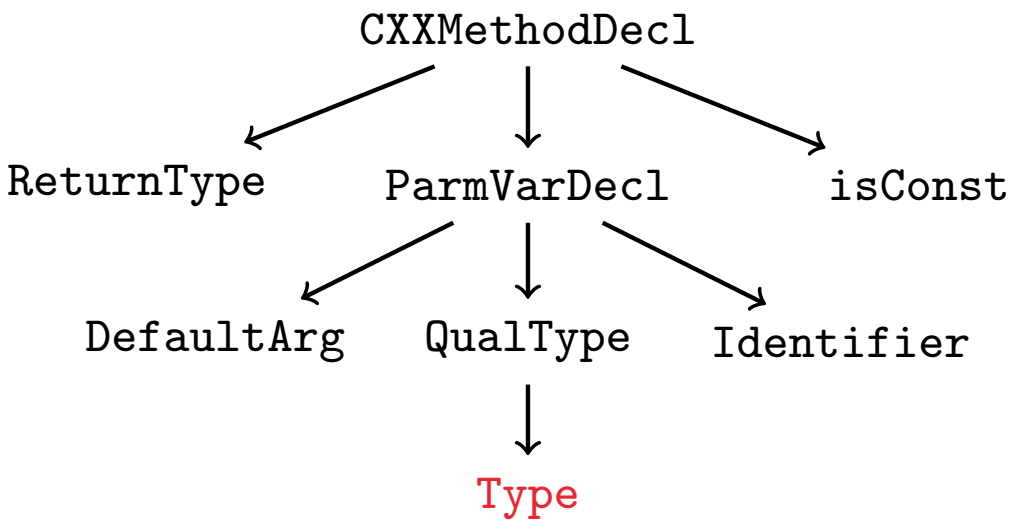

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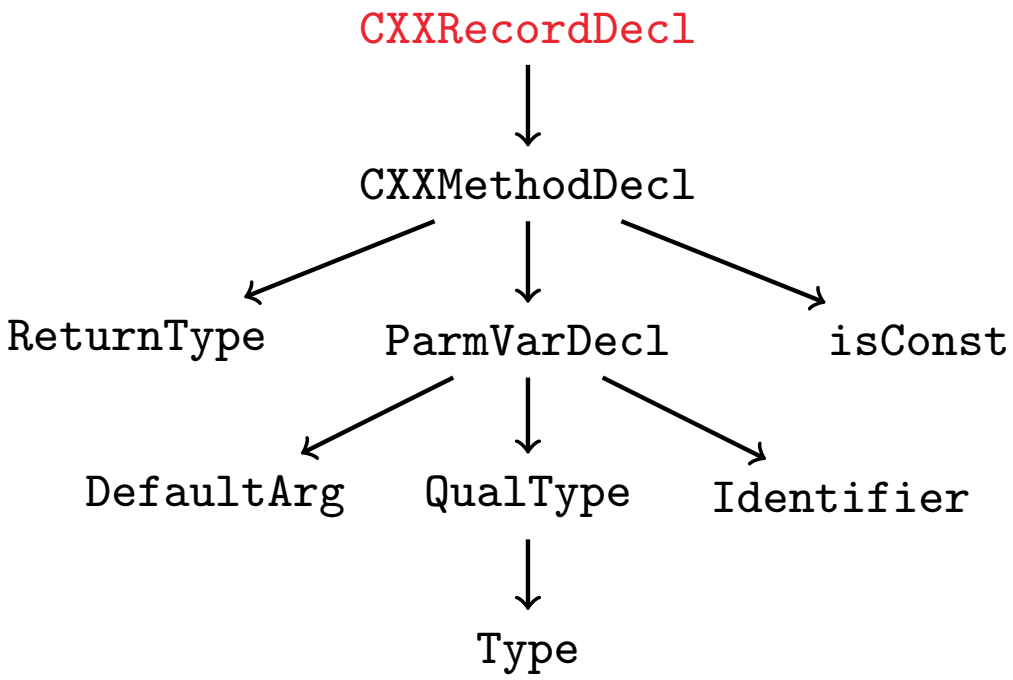

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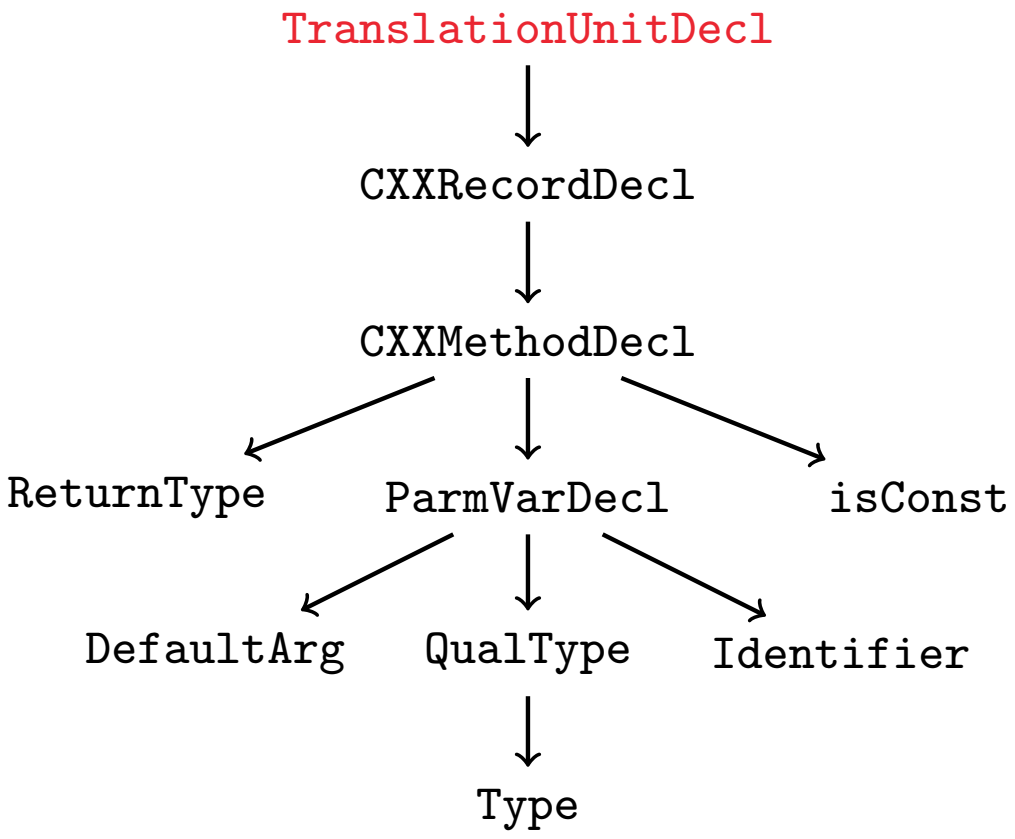

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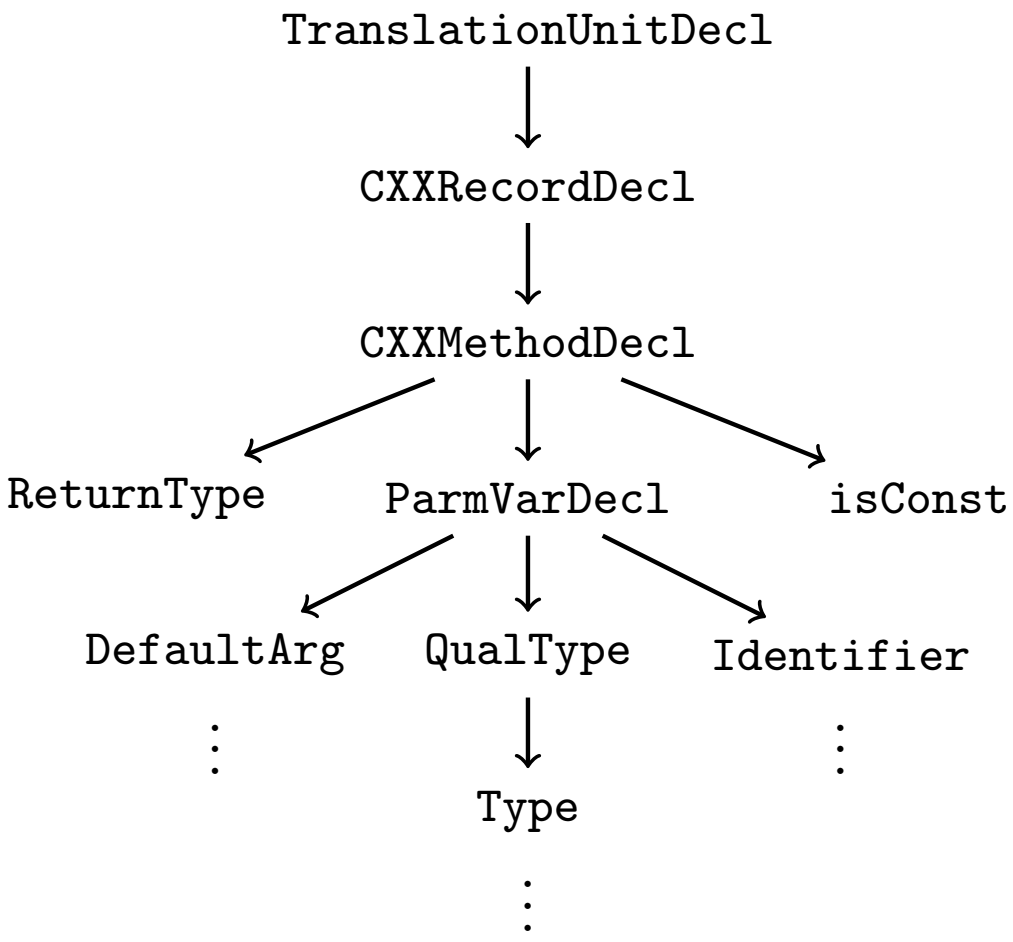

Clang: IR Generation

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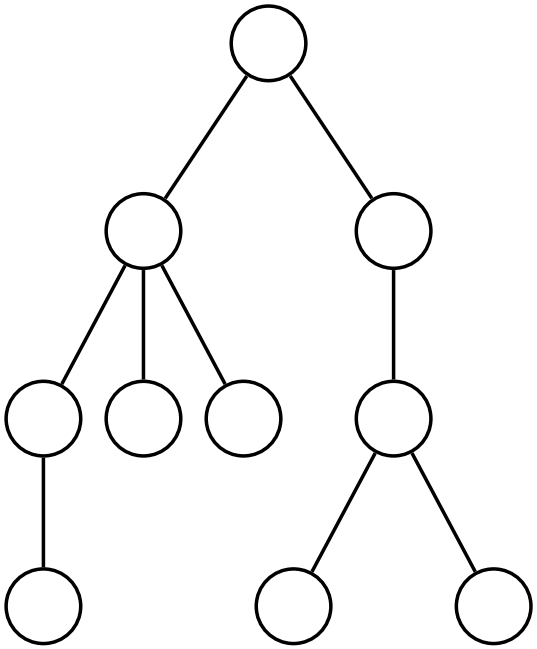
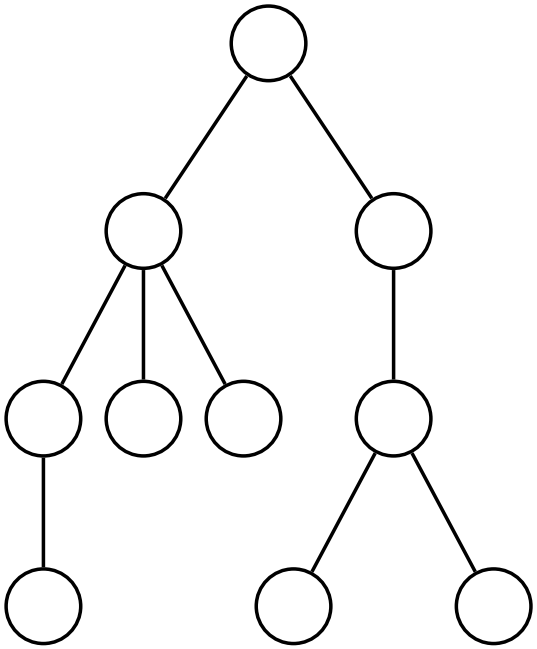


AST

Clang: IR Generation



AST

```
; Function Attrs: nounwind ssp
define i32 @_Z1fi(i32) #0 {
  %2 = alloca i32, align 4
  store i32 %0, i32* %2, align 4
  %3 = load i32, i32* %2, align 4
  ret i32 %3
}
```

Clang: AST

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```
if (0xc > 1) {
  const char* a = "ng";
}
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```
Stmt
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Clang: AST

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Stmt Decl

Clang: AST

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Stmt Decl Expr

Clang: AST

```
if (0xc > 1) {
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}
```

Stmt Decl Expr Type


CLANG
ALL THE THINGS
memegenerator.net

Clang Tooling

libClang

Clang Tooling: libClang

```
#include <stdio.h>
#include <clang-c/Index.h>

CXChildVisitResult
visit(CXCursor cursor, CXCursor, CXClientData data) {
  const CXSourceLocation location = clang_getCursorLocation(cursor);
  if (!clang_Location_isFromMainFile(location)) {
    return CXChildVisit_Continue;
  }

  const CXString spelling = clang_getCursorSpelling(cursor);
  printf("%s", clang_getCString(spelling));
  clang_disposeString(spelling);

  return CXChildVisit_Recurse;
}
```

Clang Tooling: libClang (Python)

Clang Tooling: libClang (Python)

```
import clang.cindex as clang

def walk(cursor):
  print(cursor.spelling)
  for child in cursor.get_children():
    walk(child)
```

libTooling

Clang Tooling: libTooling

Clang Tooling: libTooling

Clang Tidy

```
./clang-tidy -checks="*,my-check" file.cpp
```

Clang Tooling: libTooling

Clang Tidy

```
./clang-tidy -checks="*,my-check" file.cpp
```

Clang Plugin

```
./clang++ -Xclang load -Xclang my-check.so \
-Xclang -add-plugin -Xclang my-check file.cpp
```

Clang Tooling: libTooling

Clang Tidy

```
./clang-tidy -checks="*,my-check" file.cpp
```

Clang Plugin

```
./clang++ -Xclang load -Xclang my-check.so \
-Xclang -add-plugin -Xclang my-check file.cpp
```

Clang Tool

```
./my-check file.cpp
```


INSIDE

clangd

- Language server providing "clang-as-a-service"
- Background process that editors can interact with to obtain
  - Code Completion
  - Linting
  - Indexing
  - Formatting
- Experimental WIP: Help needed!

How do I continue?

Resources

- `eli.thegreenplace.net`
- `clang.llvm.org/docs/InternalsManual.html`
- `llvm.org/docs/ProgrammersManual.html`
- `goldsborough.me` & `github.com/goldsborough`
- Source Code!

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`github.com/peter-can-talk/cppnow-2017`

Q & A