Clang-Doc

Where We've Been and Where We're Going

LLVM Dev Meeting 2025

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Agenda

1. What, Why, and How?
2. Recent Improvements and Future Work
3. Getting Involved

What is Clang-Doc?

Clang-Doc

- Lives in clang-tools-extra
- Documentation generator started in 2018
  - Lightning Talk: https://www.youtube.com/watch?v=bTzvPhKN0YI
- Generates HTML, Markdown, YAML documentation

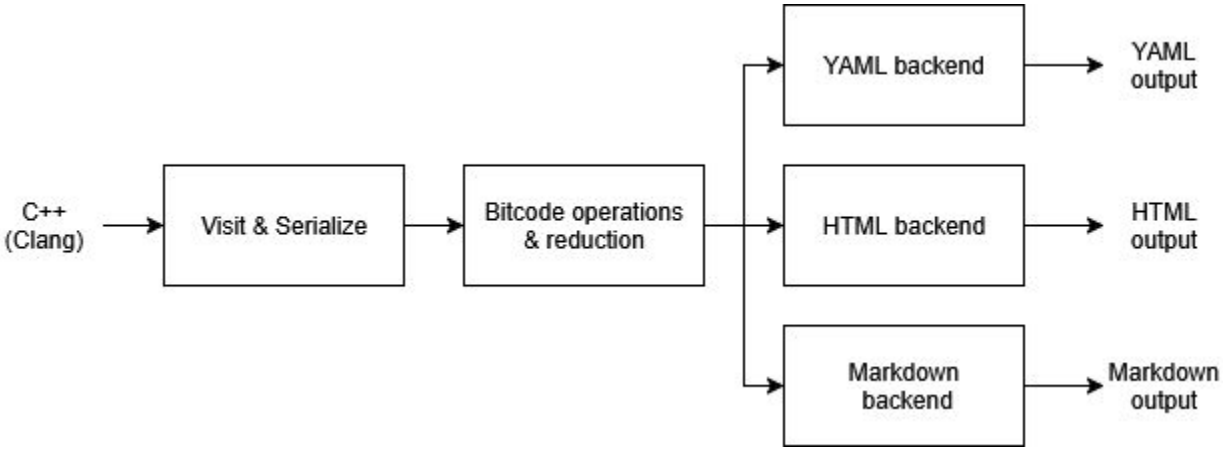
Why another documentation generator?

Other languages supply documentation generators.

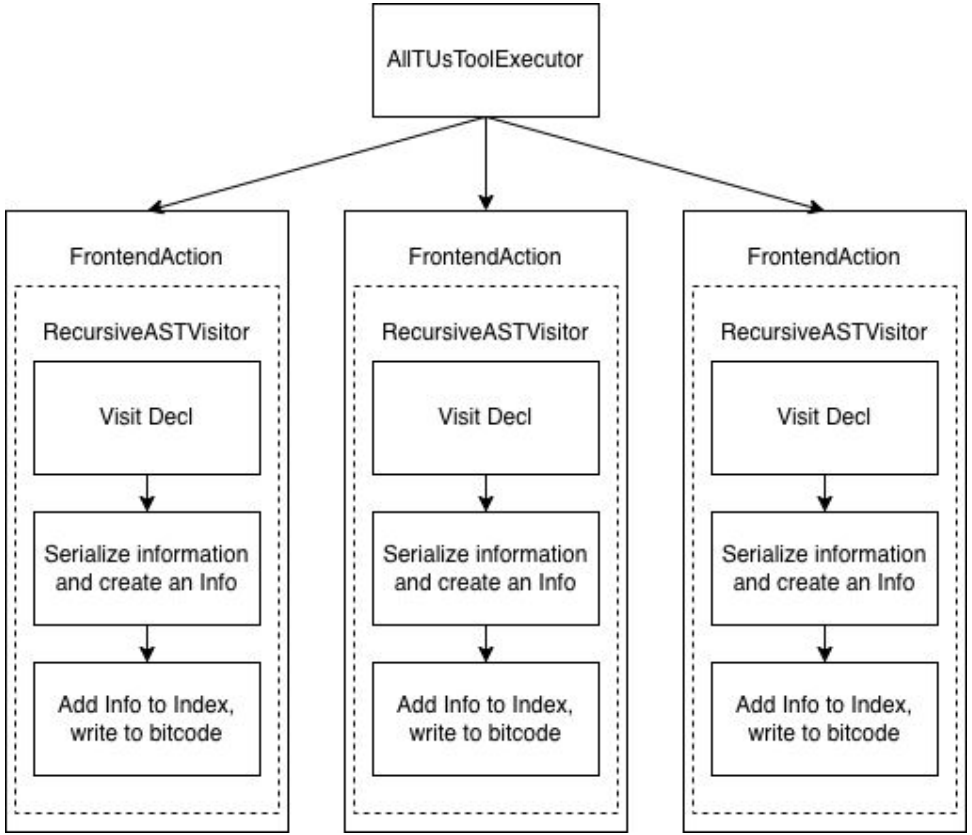
Compiler frontends are the perfect tool to generate documentation.

How Does Clang-Doc Work?

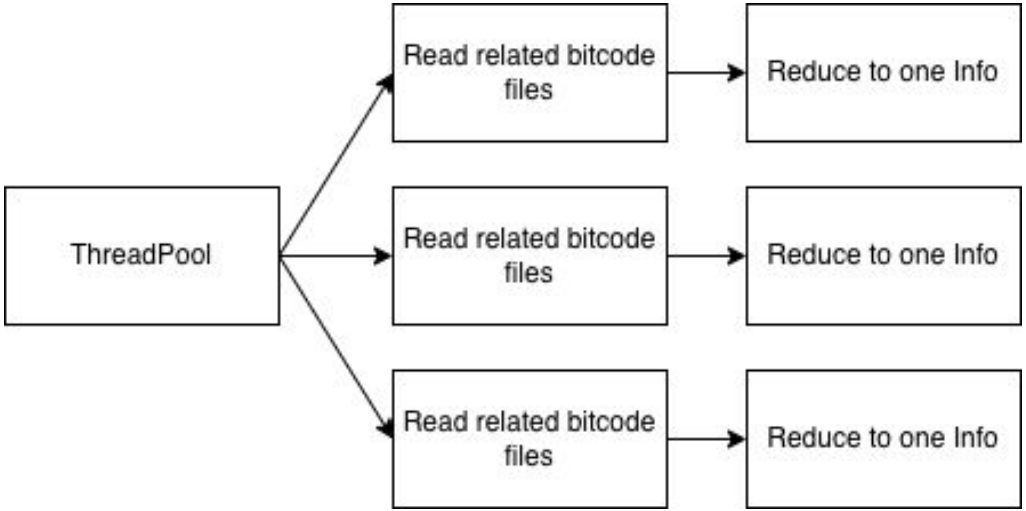
Clang-Doc’s Architecture



LibTooling-based Visitation



Bitcode Operations



Documentation Output

class Composite

Defined at line 16 of file ../../src/devices/tests/multibind-composite-test/drivers/composite.cc

Inherits from DeviceType

Functions

Composite

public void Composite(zx_device_t * parent)

Defined at line 18 of file ../../src/devices/tests/multibind-composite-test/drivers/composite.cc

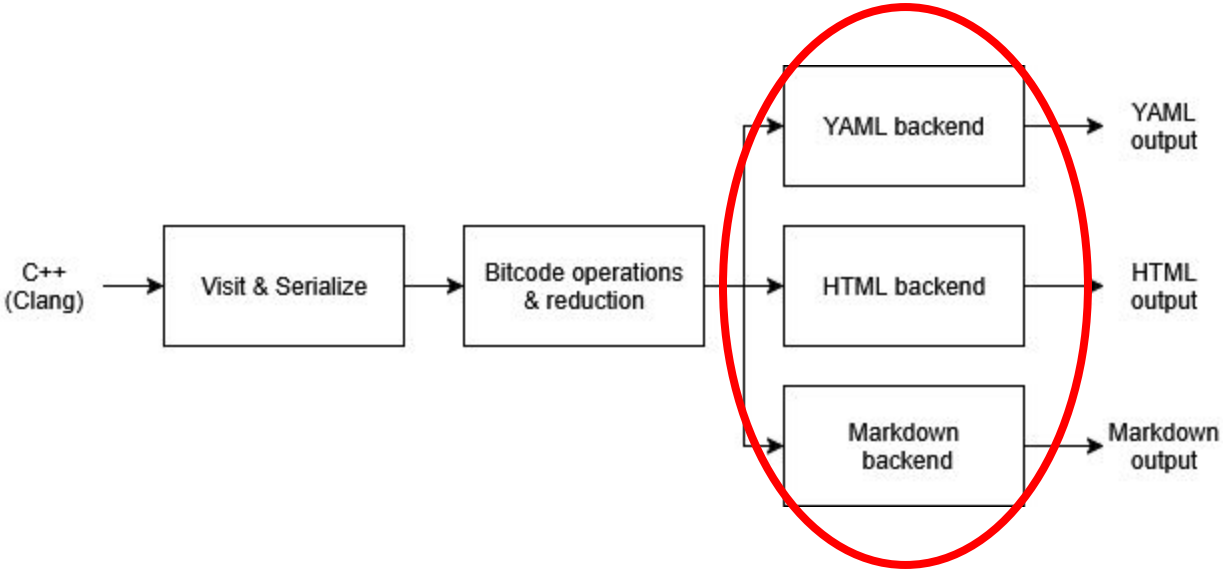
Bind

public static zx_status_t Bind(void * ctx, zx_device_t * device)

Defined at line 20 of file ../../src/devices/tests/multibind-composite-test/drivers/composite.cc

Why not iterate on the output?

Clang-Doc's Weakness



No cohesive framework!

Backend Disparity

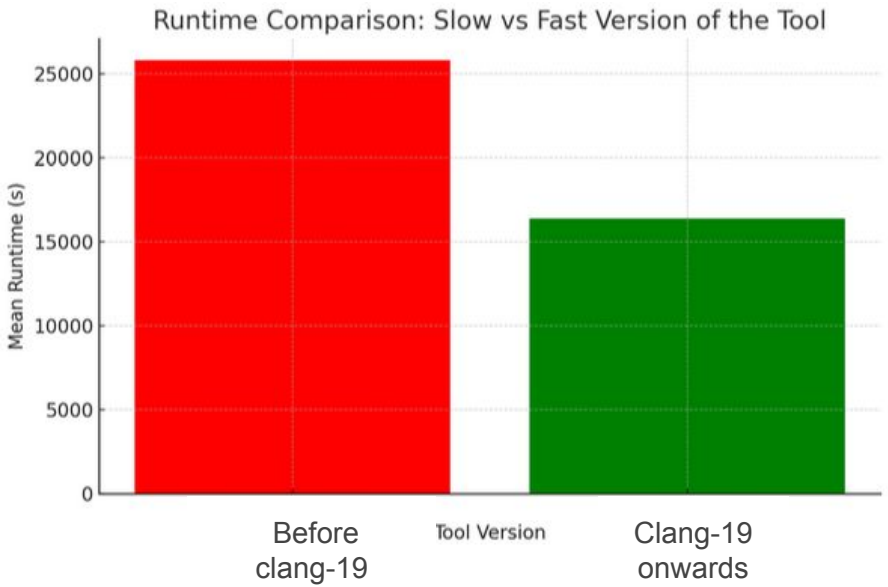
```
// HTMLGenerator.cpp
std::vector<std::unique_ptr<HTMLNode>> Parents = genReferenceList(I.Parents,
I.Path);

// MDGenerator.cpp
std::string Parents = genReferenceList(I.Parents);
```

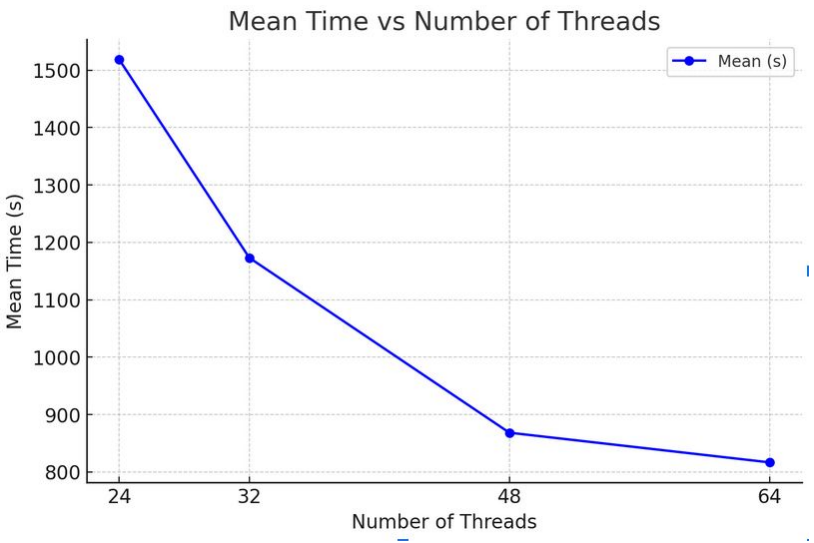
What does this web page look like?

```
void TagNode::render(llvm::raw_ostream &OS, int IndentationLevel) {
  // Children nodes are rendered in the same line if all of them are text nodes
  bool InlineChildren = true;
  for (const auto &C : Children)
    if (C->Type == NodeType::NODE_TAG) {
      InlineChildren = false;
      break;
    }
  OS.indent(IndentationLevel * 2);
  OS << "<" << Tag.toString();
  for (const auto &A : Attributes)
    OS << " " << A.first << "=\"" << A.second << "\"";
  if (Tag.isSelfClosing()) {
    OS << "/>";
    return;
  }
  OS << ">";
  if (!InlineChildren)
    OS << "\n";
  bool NewLineRendered = true;
  for (const auto &C : Children) {
    int ChildrenIndentation =
        InlineChildren || !NewLineRendered ? 0 : IndentationLevel + 1;
    C->render(OS, ChildrenIndentation);
    if (!InlineChildren && (C == Children.back() ||
                            (C->Type != NodeType::NODE_TEXT ||
                             (&C + 1)->get()->Type != NodeType::NODE_TEXT))) {
```

Improvements Over the Last Year

Performance Improvements





Mustache

A simple templating engine. Added to LLVM Support.

```
<div class="sidebar">
    <h2>{{TagType}} {{Name}}</h2>
    <ul>
        {{#HasPublicMembers}}
        <li class="sidebar-section">
            <a class="sidebar-item" href="#PublicMembers">Public Members</a>
        </li>
        <ul>
            {{#PublicMembers}}
            <li class="sidebar-item-container">
                <a class="sidebar-item" href="#{{Name}}">{{Name}}</a>
            </li>
            {{/PublicMembers}}
        </ul>
        {{/HasPublicMembers}}
```

Old HTML vs New HTML

```cpp
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            </li>
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        </ul>
        {{/HasPublicMembers}}
```

New HTML Look

class Calculator

Public Members

public_val

static_val

Public Method

add

subtract

multiply

divide

mod

class Calculator

A simple calculator class.
Provides basic arithmetic operations.

Public Members

```
int public_val
```

```
const int static_val
```

Public Methods

```
int add (int a, int b)
```

Adds two integers.

Parameters

a

First integer.

b

Second integer.

Returns

int The sum of a and b.

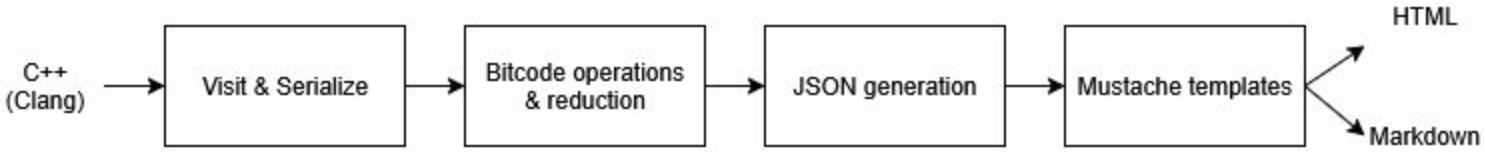
Addressing Backend Disparity

Using JSON as an IR


```
"HasPublicFunctions": true,
"InfoType": "record",
"IsTypedef": false,
"Location": {
  "Filename": "llvm/include/llvm/Transforms/Utils/SimplifyIndVar.h",
  "LineNumber": 36
},
"MangledName": "_ZTVN4llvm9IVVisitorE",
"Name": "IVVisitor",
"Namespace": [
  "llvm"
],
"Path": "llvm",
"ProtectedFunctions": [
  {
    "InfoType": "function",
    "IsStatic": false,
    "Location": {
      "Filename": "llvm/lib/Transforms/Utils/SimplifyIndVar.cpp",
      "LineNumber": 1005
    },
```

JSON improves modularity.

Streamlined Modular Architecture



Other things I did

- Concepts
- Global variables
- Friends
- Comment support revamp
- In-progress Markdown parsing

Future Work

- Cross-referencing
- Improving comment support in the Clang AST
  - Issue: https://github.com/llvm/llvm-project/issues/123582
- Transitioning backends to Mustache templates

Getting Involved

How to Use Clang-Doc

Projects:

```
$ clang-doc --format=json --executor=all-TUs ./build/compile-commands.json
```

Single file:

```
$ clang-doc --format=mustache --executor=standalone ./main.cpp
```

Docs: https://clang.llvm.org/extra/clang-doc.html

Please get involved!

- We need users to tell us what they'd like or what they're missing.
- We have a lot of areas for improvement! We'd love contributions!

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- Docs: https://clang.llvm.org/extra/clang-doc.html
- LLVM Blog: https://blog.llvm.org/posts/2025-gsoc-clang-doc/

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Thanks!