Refactoring C++ with Clang

Or how to make C++ more fun than Java

Manuel Klimek - Google

We care about...

We care about...

- Performance

We care about...

- Performance

- Productivity

We care about...

- Performance

- Productivity

- Fun

C++ gives us...

- Performance

- Productivity

- Fun

C++ gives us...

- Performance ✓

- Productivity

- Fun

C++ gives us...

- Performance ✓

- Productivity ✓

- Fun

C++ gives us...

- Performance ✓

- Productivity ✓

- Fun ?

Subject: [PATCH] Awesome new feature

On Thu, March 8, 2011 PedanticGuy wrote:
> On Wed, March 7, 2011 NewContributor wrote:
> + void DoSomethingAwesome(Cats cats);

ALL your methods are capitalized incorrectly...
Please fix. Thx.

C++ could be more fun...

Tooling!

Tooling!

Tooling!

- Correct indentation

Tooling!

- Correct indentation

- Fixing style violations

Tooling!

- Correct indentation

- Fixing style violations

- Renaming variables

Tooling!

- Correct indentation

- Fixing style violations

- Renaming variables

- Creating code structure

Challenges...

Challenges...

- X-TU

Challenges...

- X-TU

- Workflow Integration

Challenges...

- X-TU

- Workflow Integration

- Build Systems

Challenges...

- X-TU

- Workflow Integration

- Build Systems

- Speed

Tomorrowland

Clang

Tomorrowland

Libraries

Clang

Tomorrowland

Tools

Libraries

Clang

Tomorrowland

Tools

Libraries   IDE'ish Services

Clang

Tomorrowland

Tools   Editor Integration

Libraries   IDE'ish Services

Clang

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Libraries   IDE'ish Services

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Tools   Editor Integration

Libraries   IDE'ish Services
 . Tooling

Clang

Clang tooling layers

Clang tooling layers

- Clang Plugins

Clang tooling layers

- Clang Plugins

- libClang

Clang tooling layers

- Clang Plugins

- libClang

- libTooling

libTooling

- Run over a string

- Run over multiple files in a project

```cpp
bool RunToolOnCode(
    FrontendAction *ToolAction,
    Twine Code,
    Twine FileName);
```

Tomorrowland

Tools   Editor Integration

Libraries   IDE'ish Services
  • Tooling

Clang

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Tools   Editor Integration

Libraries   IDE'ish Services
- Tooling
- Refactoring

Clang

Hide ALL the complexity!

- Apply

- Deduplicated

- Edits

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- ASTMatchers

Clang

RAV Considered Complicated

Call(Callee(Method(HasName(
    "eat")))

eat();
honey.eat();
(*eat)();

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Clang

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Tools

- clang-format

Editor Integration

Libraries

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IDE'ish Services

Clang

The Whitespace Cure

- configurable

- boxable

- context sensitive

- correct

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- clang-lint

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Phoenix rising

- interactive automatic fixes

- configure patterns

- minimize false positives

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- clang-lint

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Tools

- clang-format
- clang-lint
- clang-rename

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Common Code Transformations

- autonomous and integrated

- fast and correct

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Libraries   IDE'ish Services
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IDE'ish Services

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Libraries   IDE'ish Services
- Tooling   ClangD
- Refactoring
- ASTMatchers

Clang

ClangD manages...

- dirty buffers

- caches parsing

- open RPC interface

- build system integration

ClangD provides...

- fast context information

- complete code

- run actions

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Tools

- clang-format
- clang-lint
- clang-rename

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Clang

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Clang

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Libraries
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- Refactoring
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Editor Integration
- Emacs
- Vim
- Eclipse

IDE'ish Services
ClangD

Clang

IDE everywhere

- command line

- emacs, vi

- integrate other IDEs

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Tools

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IDE'ish Services
ClangD

Clang

Where are we?

- Libraries... in progress.

- Tools... early spikes.

- ClangD... entering design phase.

- Editor integration...

What's next?

You!

References

Discussions, ideas:

Bring them up on cfe-dev@cs.uiuc.edu

Tooling Branch (beware, spiky)

cfe/branches/tooling

Clang MapReduce -- Automatic C++ Refactoring at Google Scale

http://llvm.org/devmtg/2011-11/#talk2