

難読化オープンソースソフトウェアについて

難読化コード (Obfuscated code) とは

難読化コード (Obfuscated code) とは、コンピュータプログラムにおいて、その内部的な動作の手続き内容・構造・データなどを人間が理解しにくい、あるいはそのようになるよう加工されたソースコードやマシンコードのことを示す。

難読化は、コードの目的を隠蔽したり、改竄 (タンパリング) やリバースエンジニアリングを阻止する目的のため、プログラムのコーディング、専用アプリケーション、または開発ツールの補助機能によって、ソースコードや実行コードに対して故意にコードやロジックを難読化、曖昧化を施される。

しかし、難読化は単なる時間稼ぎに過ぎず、プログラムのリバースエンジニアリングを不可能とするものではない。また、依存性の注入 (Dependency Injection (DI)) などの目的で、参照する対象の名前を文字列で与えるようなリフレクション・自己反映計算 API を利用している場合などでも、原理的に難読化によって動かなくなるため、難読化が可能な部分が制限される。

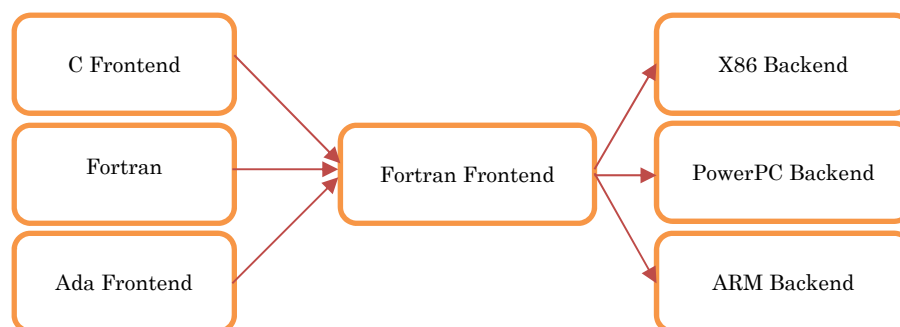
難読化コードを生成するソフトウェア

コードの難読化を実行したりサポートするソフトウェアは、obfuscators とよばれるオープンソースソフトウェアや商用製品がある。

以下に、前述されたアプリケーションプログラムの難読化を行うオープンソース Obfuscator-LLVM に含まれる clang について記述する。

Obfuscator-LLVM とは、LLVM の中間コードに対して 難読化 を行う オープンソースソフトウェアの実装である。

この時、LLVM とは、コンパイル時、リンク時、実行時などあらゆる時点でプログラムを最適化するように設計された、任意のプログラミング言語に対応可能なコンパイラ基盤である。LLVM 自体は C++ で書かれており、イリノイ大学で 2000 年に開発が開始されたものである。ライセンス条件は University of Illinois Open Source License であり、これは BSD ライセンスによく似た OSI 認証ライセンスである。



The LLVM Compilation Framework

Obfuscator-LLVM(3.6.1)のインストール

手順① cmake のダウンロードとインストール

<https://cmake.org/download/> から `cmake-3.8.1.tar.gz` をダウンロードし、以下の手順で `cmake` をインストールする。

```
# tar xvfz cmake-3.8.1.tar.gz
# cd cmake-3.8.1
# ./configure
# make
# make install
```

手順② llvm のダウンロードとインストール

以下の手順で `llvm` をインストールする。約 2 時間かかる。

```
# git clone -b llvm-3.6.1 https://github.com/obfuscator-llvm/obfuscator.git
# mkdir build
# cd build
# cmake -DCMAKE_BUILD_TYPE:String=Release ../obfuscator/
# make -j5
# make install
```

手順③ 動作確認

`/usr/local/bin` 配下に `clang` がインストールされているので例えば `hello.c`

```
#include <stdio.h>

int main()
{
    printf("Hello¥n");
}
```

を

```
# gcc hello.c -o hellogcc
# clang hello.c -mllvm -sub -mllvm -fla -mllvm -bcf -o hellollvm
```

どちらも実行すると

が表示される。

下記コマンドでアセンブラ出力を確認する。

```
# clang hello.c -mllvm -sub -mllvm -fla -mllvm -bcf -S
```

```

.text
.file      "hello.c"
.globl     main
.align     16, 0x90
.type      main,@function

main:                                             # @main
        .cfi_startproc

# BB#0:                                          # %entry
        pushq   %rbp

.Ltmp0:
        .cfi_def_cfa_offset 16

.Ltmp1:
        .cfi_offset %rbp, -16
        movq    %rsp, %rbp

.Ltmp2:
        .cfi_def_cfa_register %rbp
        subq    $16, %rsp
        movabsq $0, %rax
        movb    $0, %al
        callq   printf
        xorl    %ecx, %ecx
        movl    %eax, -4(%rbp)                  # 4-byte Spill
        movl    %ecx, %eax

```

```

    addq    $16, %rsp
    popq    %rbp
    retq

.Ltmp3:
    .size   main, .Ltmp3-main
    .cfi_endproc

    .type   .L.str,@object          # @.str
    .section .rodata.str1.1,"aMS",@progbits,1
.L.str:
    .asciz  "Hello¥n"
    .size   .L.str, 7

    .type   x,@object               # @x
    .comm   x,4,4
    .type   y,@object               # @y
    .comm   y,4,4

    .ident  "Obfuscator-LLVM clang version 3.6.1 (tags/RELEASE_361/final)
(based on Obfuscator-LLVM 3.6.1)"
    .section ".note.GNU-stack","",@progbits

```

nm 出力確認

nm で確認すると 同様に x および y の存在しないエントリができて難読化されている

nm hellogcc	nm hellollvm
0000000000600e28 d _DYNAMIC	0000000000600e28 d _DYNAMIC
0000000000601000 d _GLOBAL_OFFSET_TABLE_	0000000000601000d GLOBAL_OFFSET_TABLE_
00000000004005c0 R _IO_stdin_used	00000000004005d0 R _IO_stdin_used
w _ITM_deregisterTMCloneTable	w _ITM_deregisterTMCloneTable
w _ITM_registerTMCloneTable	w _ITM_registerTMCloneTable
w _Jv_RegisterClasses	w _Jv_RegisterClasses
0000000000400700 r __FRAME_END__	0000000000400728 r __FRAME_END__
0000000000600e20 d __JCR_END__	0000000000600e20 d __JCR_END__
0000000000600e20 d __JCR_LIST__	0000000000600e20 d __JCR_LIST__

0000000000601038 D __TMC_END__	0000000000601038 D __TMC_END__
0000000000601034 B __bss_start	0000000000601034 B __bss_start
0000000000601030 D __data_start	0000000000601030 D __data_start
00000000004004e0 t __do_global_dtors_aux	00000000004004d0 t __do_global_dtors_aux
0000000000600e18 t	0000000000600e18 t
__do_global_dtors_aux_fini_array_entry	__do_global_dtors_aux_fini_array_entry
00000000004005c8 R __dso_handle	00000000004005d8 R __dso_handle
0000000000600e10 t	0000000000600e10 t
__frame_dummy_init_array_entry	__frame_dummy_init_array_entry
w __gmon_start__	w __gmon_start__
0000000000600e18 t __init_array_end	0000000000600e18 t __init_array_end
0000000000600e10 t __init_array_start	0000000000600e10 t __init_array_start
00000000004005b0 T __libc_csu_fini	00000000004005c0 T __libc_csu_fini
0000000000400540 T __libc_csu_init	0000000000400550 T __libc_csu_init
U	U
__libc_start_main@@GLIBC_2.2.5	__libc_start_main@@GLIBC_2.2.5
0000000000601034 D _edata	0000000000601034 D _edata
0000000000601038 B _end	0000000000601040 B _end
00000000004005b4 T _fini	00000000004005c4 T _fini
00000000004003e0 T _init	00000000004003e8 T _init
0000000000400440 T _start	0000000000400430 T _start
0000000000601034 b completed.6344	0000000000601034 b completed.6344
0000000000601030 W data_start	0000000000601030 W data_start
0000000000400470 t deregister_tm_clones	0000000000400460 t deregister_tm_clones
0000000000400500 t frame_dummy	00000000004004f0 t frame_dummy
0000000000400530 T main	0000000000400520 T main
U puts@@GLIBC_2.2.5	U printf@@GLIBC_2.2.5
00000000004004a0 t register_tm_clones	0000000000400490 t register_tm_clones
	0000000000601038 B x
	000000000060103c B y

インストールされるファイル

```
Install the project...
-- Install configuration: ""
-- Installing: /usr/local/include/llvm
-- Installing: /usr/local/include/llvm/ADT
-- Installing: /usr/local/include/llvm/ADT/APFloat.h
-- Installing: /usr/local/include/llvm/ADT/APInt.h
-- Installing: /usr/local/include/llvm/ADT/APSInt.h
-- Installing: /usr/local/include/llvm/ADT/ArrayRef.h
-- Installing: /usr/local/include/llvm/ADT/BitVector.h
-- Installing: /usr/local/include/llvm/ADT/DAGDeltaAlgorithm.h
-- Installing: /usr/local/include/llvm/ADT/DeltaAlgorithm.h
-- Installing: /usr/local/include/llvm/ADT/DenseMap.h
-- Installing: /usr/local/include/llvm/ADT/DenseMapInfo.h
-- Installing: /usr/local/include/llvm/ADT/DenseSet.h
-- Installing: /usr/local/include/llvm/ADT/DepthFirstIterator.h
-- Installing: /usr/local/include/llvm/ADT/EquivalenceClasses.h
-- Installing: /usr/local/include/llvm/ADT/FoldingSet.h
-- Installing: /usr/local/include/llvm/ADT/GraphTraits.h
-- Installing: /usr/local/include/llvm/ADT/Hashing.h
-- Installing: /usr/local/include/llvm/ADT/ImmutableList.h
-- Installing: /usr/local/include/llvm/ADT/ImmutableMap.h
-- Installing: /usr/local/include/llvm/ADT/ImmutableSet.h
-- Installing: /usr/local/include/llvm/ADT/IndexedMap.h
-- Installing: /usr/local/include/llvm/ADT/IntEqClasses.h
-- Installing: /usr/local/include/llvm/ADT/IntervalMap.h
-- Installing: /usr/local/include/llvm/ADT/IntrusiveRefCntPtr.h
-- Installing: /usr/local/include/llvm/ADT/MapVector.h
-- Installing: /usr/local/include/llvm/ADT/None.h
-- Installing: /usr/local/include/llvm/ADT/Optional.h
-- Installing: /usr/local/include/llvm/ADT/PackedVector.h
-- Installing: /usr/local/include/llvm/ADT/PointerIntPair.h
-- Installing: /usr/local/include/llvm/ADT/PointerUnion.h
-- Installing: /usr/local/include/llvm/ADT/PostOrderIterator.h
-- Installing: /usr/local/include/llvm/ADT/PriorityQueue.h
-- Installing: /usr/local/include/llvm/ADT/SCCIterator.h
-- Installing: /usr/local/include/llvm/ADT/STLExtras.h
-- Installing: /usr/local/include/llvm/ADT/ScopedHashTable.h
-- Installing: /usr/local/include/llvm/ADT/SetOperations.h
-- Installing: /usr/local/include/llvm/ADT/SetVector.h
-- Installing: /usr/local/include/llvm/ADT/SmallBitVector.h
-- Installing: /usr/local/include/llvm/ADT/SmallPtrSet.h
-- Installing: /usr/local/include/llvm/ADT/SmallSet.h
-- Installing: /usr/local/include/llvm/ADT/SmallString.h
-- Installing: /usr/local/include/llvm/ADT/SmallVector.h
-- Installing: /usr/local/include/llvm/ADT/SparseBitVector.h
-- Installing: /usr/local/include/llvm/ADT/SparseMultiSet.h
-- Installing: /usr/local/include/llvm/ADT/SparseSet.h
-- Installing: /usr/local/include/llvm/ADT/Statistic.h
-- Installing: /usr/local/include/llvm/ADT/StringExtras.h
-- Installing: /usr/local/include/llvm/ADT/StringMap.h
-- Installing: /usr/local/include/llvm/ADT/StringRef.h
-- Installing: /usr/local/include/llvm/ADT/StringSet.h
-- Installing: /usr/local/include/llvm/ADT/StringSwitch.h
-- Installing: /usr/local/include/llvm/ADT/TinyPtrVector.h
-- Installing: /usr/local/include/llvm/ADT/Triple.h
-- Installing: /usr/local/include/llvm/ADT/Twine.h
-- Installing: /usr/local/include/llvm/ADT/UniqueVector.h
-- Installing: /usr/local/include/llvm/ADT/VariadicFunction.h
-- Installing: /usr/local/include/llvm/ADT/edit_distance.h
-- Installing: /usr/local/include/llvm/ADT/ilist.h
-- Installing: /usr/local/include/llvm/ADT/ilist_node.h
-- Installing: /usr/local/include/llvm/ADT/iterator.h
-- Installing: /usr/local/include/llvm/ADT/iterator_range.h
-- Installing: /usr/local/include/llvm/Analysis
-- Installing: /usr/local/include/llvm/Analysis/AliasAnalysis.h
-- Installing: /usr/local/include/llvm/Analysis/AliasSetTracker.h
-- Installing: /usr/local/include/llvm/Analysis/AssumptionCache.h
-- Installing: /usr/local/include/llvm/Analysis/BlockFrequencyInfo.h
-- Installing: /usr/local/include/llvm/Analysis/BlockFrequencyInfoImpl.h
```

-- Installing: /usr/local/include/llvm/Analysis/BranchProbabilityInfo.h
-- Installing: /usr/local/include/llvm/Analysis/CFG.h
-- Installing: /usr/local/include/llvm/Analysis/CFGPrinter.h
-- Installing: /usr/local/include/llvm/Analysis/CGSCCPassManager.h
-- Installing: /usr/local/include/llvm/Analysis/CallGraph.h
-- Installing: /usr/local/include/llvm/Analysis/CallGraphSCCPass.h
-- Installing: /usr/local/include/llvm/Analysis/CallPrinter.h
-- Installing: /usr/local/include/llvm/Analysis/CaptureTracking.h
-- Installing: /usr/local/include/llvm/Analysis/CodeMetrics.h
-- Installing: /usr/local/include/llvm/Analysis/ConstantFolding.h
-- Installing: /usr/local/include/llvm/Analysis/ConstantsScanner.h
-- Installing: /usr/local/include/llvm/Analysis/DOTGraphTraitsPass.h
-- Installing: /usr/local/include/llvm/Analysis/DependenceAnalysis.h
-- Installing: /usr/local/include/llvm/Analysis/DomPrinter.h
-- Installing: /usr/local/include/llvm/Analysis/DominanceFrontier.h
-- Installing: /usr/local/include/llvm/Analysis/DominanceFrontierImpl.h
-- Installing: /usr/local/include/llvm/Analysis/FunctionTargetTransformInfo.h
-- Installing: /usr/local/include/llvm/Analysis/IVUsers.h
-- Installing: /usr/local/include/llvm/Analysis/InlineCost.h
-- Installing: /usr/local/include/llvm/Analysis/InstructionSimplify.h
-- Installing: /usr/local/include/llvm/Analysis/Interval.h
-- Installing: /usr/local/include/llvm/Analysis/IntervalIterator.h
-- Installing: /usr/local/include/llvm/Analysis/IntervalPartition.h
-- Installing: /usr/local/include/llvm/Analysis/JumpInstTableInfo.h
-- Installing: /usr/local/include/llvm/Analysis/LazyCallGraph.h
-- Installing: /usr/local/include/llvm/Analysis/LazyValueInfo.h
-- Installing: /usr/local/include/llvm/Analysis/LibCallAliasAnalysis.h
-- Installing: /usr/local/include/llvm/Analysis/LibCallSemantics.h
-- Installing: /usr/local/include/llvm/Analysis/Lint.h
-- Installing: /usr/local/include/llvm/Analysis/Loads.h
-- Installing: /usr/local/include/llvm/Analysis/LoopInfo.h
-- Installing: /usr/local/include/llvm/Analysis/LoopInfoImpl.h
-- Installing: /usr/local/include/llvm/Analysis/LoopIterator.h
-- Installing: /usr/local/include/llvm/Analysis/LoopPass.h
-- Installing: /usr/local/include/llvm/Analysis/MemoryBuiltins.h
-- Installing: /usr/local/include/llvm/Analysis/MemoryDependenceAnalysis.h
-- Installing: /usr/local/include/llvm/Analysis/PHITransAddr.h
-- Installing: /usr/local/include/llvm/Analysis/Passes.h
-- Installing: /usr/local/include/llvm/Analysis/PostDominators.h
-- Installing: /usr/local/include/llvm/Analysis/PtrUseVisitor.h
-- Installing: /usr/local/include/llvm/Analysis/RegionInfo.h
-- Installing: /usr/local/include/llvm/Analysis/RegionInfoImpl.h
-- Installing: /usr/local/include/llvm/Analysis/RegionIterator.h
-- Installing: /usr/local/include/llvm/Analysis/RegionPass.h
-- Installing: /usr/local/include/llvm/Analysis/RegionPrinter.h
-- Installing: /usr/local/include/llvm/Analysis/ScalarEvolution.h
-- Installing: /usr/local/include/llvm/Analysis/ScalarEvolutionExpander.h
-- Installing: /usr/local/include/llvm/Analysis/ScalarEvolutionExpressions.h
-- Installing: /usr/local/include/llvm/Analysis/ScalarEvolutionNormalization.h
-- Installing: /usr/local/include/llvm/Analysis/SparsePropagation.h
-- Installing: /usr/local/include/llvm/Analysis/TargetFolder.h
-- Installing: /usr/local/include/llvm/Analysis/TargetTransformInfo.h
-- Installing: /usr/local/include/llvm/Analysis/Trace.h
-- Installing: /usr/local/include/llvm/Analysis/ValueTracking.h
-- Installing: /usr/local/include/llvm/AsmParser
-- Installing: /usr/local/include/llvm/AsmParser/Parser.h
-- Installing: /usr/local/include/llvm/Bitcode
-- Installing: /usr/local/include/llvm/Bitcode/BitCodes.h
-- Installing: /usr/local/include/llvm/Bitcode/BitcodeWriterPass.h
-- Installing: /usr/local/include/llvm/Bitcode/BitstreamReader.h
-- Installing: /usr/local/include/llvm/Bitcode/BitstreamWriter.h
-- Installing: /usr/local/include/llvm/Bitcode/LLVMBitCodes.h
-- Installing: /usr/local/include/llvm/Bitcode/ReaderWriter.h
-- Installing: /usr/local/include/llvm/CodeGen
-- Installing: /usr/local/include/llvm/CodeGen/Analysis.h
-- Installing: /usr/local/include/llvm/CodeGen/AsmPrinter.h
-- Installing: /usr/local/include/llvm/CodeGen/CalcSpillWeights.h
-- Installing: /usr/local/include/llvm/CodeGen/CallingConvLower.h
-- Installing: /usr/local/include/llvm/CodeGen/CommandFlags.h
-- Installing: /usr/local/include/llvm/CodeGen/DAGCombine.h
-- Installing: /usr/local/include/llvm/CodeGen/DFAPacketizer.h
-- Installing: /usr/local/include/llvm/CodeGen/DIE.h
-- Installing: /usr/local/include/llvm/CodeGen/EdgeBundles.h

```

-- Installing: /usr/local/include/llvm/CodeGen/FastISel.h
-- Installing: /usr/local/include/llvm/CodeGen/ForwardControlFlowIntegrity.h
-- Installing: /usr/local/include/llvm/CodeGen/FunctionLoweringInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/GCMetadata.h
-- Installing: /usr/local/include/llvm/CodeGen/GCMetadataPrinter.h
-- Installing: /usr/local/include/llvm/CodeGen/GCStrategy.h
-- Installing: /usr/local/include/llvm/CodeGen/GCs.h
-- Installing: /usr/local/include/llvm/CodeGen/ISDOpcodes.h
-- Installing: /usr/local/include/llvm/CodeGen/IntrinsicLowering.h
-- Installing: /usr/local/include/llvm/CodeGen/JumpInstrTables.h
-- Installing: /usr/local/include/llvm/CodeGen/LatencyPriorityQueue.h
-- Installing: /usr/local/include/llvm/CodeGen/LexicalScopes.h
-- Installing: /usr/local/include/llvm/CodeGen/LinkAllAsmWriterComponents.h
-- Installing: /usr/local/include/llvm/CodeGen/LinkAllCodegenComponents.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveInterval.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveIntervalAnalysis.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveIntervalUnion.h
-- Installing: /usr/local/include/llvm/CodeGen/LivePhysRegs.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveRangeEdit.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveRegMatrix.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveStackAnalysis.h
-- Installing: /usr/local/include/llvm/CodeGen/LiveVariables.h
-- Installing: /usr/local/include/llvm/CodeGen/MachORelocation.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineBasicBlock.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineBlockFrequencyInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineBranchProbabilityInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineCombinerPattern.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineConstantPool.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineDominanceFrontier.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineDominators.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineFrameInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineFunction.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineFunctionAnalysis.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineFunctionPass.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineInstr.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineInstrBuilder.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineInstrBundle.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineJumpTableInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineLoopInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineMemOperand.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineModuleInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineModuleInfoImpls.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineOperand.h
-- Installing: /usr/local/include/llvm/CodeGen/MachinePassRegistry.h
-- Installing: /usr/local/include/llvm/CodeGen/MachinePostDominators.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineRegionInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineRegisterInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineSSAUpdater.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineScheduler.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineTraceMetrics.h
-- Installing: /usr/local/include/llvm/CodeGen/MachineValueType.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQP
-- Installing: /usr/local/include/llvm/CodeGen/PBQP/CostAllocator.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQP/Graph.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQP/Math.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQP/ReductionRules.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQP/Solution.h
-- Installing: /usr/local/include/llvm/CodeGen/PBQPRACConstraint.h
-- Installing: /usr/local/include/llvm/CodeGen/Passes.h
-- Installing: /usr/local/include/llvm/CodeGen/PseudoSourceValue.h
-- Installing: /usr/local/include/llvm/CodeGen/RegAllocPBQP.h
-- Installing: /usr/local/include/llvm/CodeGen/RegAllocRegistry.h
-- Installing: /usr/local/include/llvm/CodeGen/RegisterClassInfo.h
-- Installing: /usr/local/include/llvm/CodeGen/RegisterPressure.h
-- Installing: /usr/local/include/llvm/CodeGen/RegisterScavenging.h
-- Installing: /usr/local/include/llvm/CodeGen/ResourcePriorityQueue.h
-- Installing: /usr/local/include/llvm/CodeGen/RuntimeLibcalls.h
-- Installing: /usr/local/include/llvm/CodeGen/ScheduleDAG.h
-- Installing: /usr/local/include/llvm/CodeGen/ScheduleDAGInstrs.h
-- Installing: /usr/local/include/llvm/CodeGen/ScheduleDFS.h
-- Installing: /usr/local/include/llvm/CodeGen/ScheduleHazardRecognizer.h
-- Installing: /usr/local/include/llvm/CodeGen/SchedulerRegistry.h
-- Installing: /usr/local/include/llvm/CodeGen/ScoreboardHazardRecognizer.h

```

```

-- Installing: /usr/local/include/llvm/CodeGen/SelectionDAG.h
-- Installing: /usr/local/include/llvm/CodeGen/SelectionDAGISel.h
-- Installing: /usr/local/include/llvm/CodeGen/SelectionDAGNodes.h
-- Installing: /usr/local/include/llvm/CodeGen/SlotIndexes.h
-- Installing: /usr/local/include/llvm/CodeGen/StackMapLivenessAnalysis.h
-- Installing: /usr/local/include/llvm/CodeGen/StackMaps.h
-- Installing: /usr/local/include/llvm/CodeGen/StackProtector.h
-- Installing: /usr/local/include/llvm/CodeGen/TargetLoweringObjectFileImpl.h
-- Installing: /usr/local/include/llvm/CodeGen/TargetSchedule.h
-- Installing: /usr/local/include/llvm/CodeGen/ValueTypes.h
-- Installing: /usr/local/include/llvm/CodeGen/ValueTypes.td
-- Installing: /usr/local/include/llvm/CodeGen/VirtRegMap.h
-- Installing: /usr/local/include/llvm/Config
-- Installing: /usr/local/include/llvm/CryptoUtils.h
-- Installing: /usr/local/include/llvm/DebugInfo
-- Installing: /usr/local/include/llvm/DebugInfo/DIContext.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFAbbreviationDeclaration.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFAcceleratorTable.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFCompileUnit.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFContext.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugAbbrev.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugArangeSet.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugAranges.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugFrame.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugInfoEntry.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugLine.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugLoc.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFDebugRangeList.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFFormValue.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFRelocMap.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFSection.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFTypeUnit.h
-- Installing: /usr/local/include/llvm/DebugInfo/DWARFUnit.h
-- Installing: /usr/local/include/llvm/ExecutionEngine
-- Installing: /usr/local/include/llvm/ExecutionEngine/ExecutionEngine.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/GenericValue.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/Interpreter.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/JITEventListener.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/MCJIT.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/OProfileWrapper.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/ObjectCache.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/RTDyldMemoryManager.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/RuntimeDyld.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/RuntimeDyldChecker.h
-- Installing: /usr/local/include/llvm/ExecutionEngine/SectionMemoryManager.h
-- Installing: /usr/local/include/llvm/IR
-- Installing: /usr/local/include/llvm/IR/Argument.h
-- Installing: /usr/local/include/llvm/IR/AssemblyAnnotationWriter.h
-- Installing: /usr/local/include/llvm/IR/Attributes.h
-- Installing: /usr/local/include/llvm/IR/AutoUpgrade.h
-- Installing: /usr/local/include/llvm/IR/BasicBlock.h
-- Installing: /usr/local/include/llvm/IR/CFG.h
-- Installing: /usr/local/include/llvm/IR/CallSite.h
-- Installing: /usr/local/include/llvm/IR/CallingConv.h
-- Installing: /usr/local/include/llvm/IR/Comdat.h
-- Installing: /usr/local/include/llvm/IR/Constant.h
-- Installing: /usr/local/include/llvm/IR/ConstantFolder.h
-- Installing: /usr/local/include/llvm/IR/ConstantRange.h
-- Installing: /usr/local/include/llvm/IR/Constants.h
-- Installing: /usr/local/include/llvm/IR/DIBuilder.h
-- Installing: /usr/local/include/llvm/IR/DataLayout.h
-- Installing: /usr/local/include/llvm/IR/DebugInfo.h
-- Installing: /usr/local/include/llvm/IR/DebugLoc.h
-- Installing: /usr/local/include/llvm/IR/DerivedTypes.h
-- Installing: /usr/local/include/llvm/IR/DiagnosticInfo.h
-- Installing: /usr/local/include/llvm/IR/DiagnosticPrinter.h
-- Installing: /usr/local/include/llvm/IR/Dominators.h
-- Installing: /usr/local/include/llvm/IR/Function.h
-- Installing: /usr/local/include/llvm/IR/GVMaterializer.h
-- Installing: /usr/local/include/llvm/IR/GetElementPtrTyperIterator.h
-- Installing: /usr/local/include/llvm/IR/GlobalAlias.h
-- Installing: /usr/local/include/llvm/IR/GlobalObject.h
-- Installing: /usr/local/include/llvm/IR/GlobalValue.h

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-- Installing: /usr/local/include/llvm/IR/GlobalVariable.h
-- Installing: /usr/local/include/llvm/IR/IRBuilder.h
-- Installing: /usr/local/include/llvm/IR/IRPrintingPasses.h
-- Installing: /usr/local/include/llvm/IR/InlineAsm.h
-- Installing: /usr/local/include/llvm/IR/InstIterator.h
-- Installing: /usr/local/include/llvm/IR/InstVisitor.h
-- Installing: /usr/local/include/llvm/IR/InstrTypes.h
-- Installing: /usr/local/include/llvm/IR/Instruction.def
-- Installing: /usr/local/include/llvm/IR/Instruction.h
-- Installing: /usr/local/include/llvm/IR/Instructions.h
-- Installing: /usr/local/include/llvm/IR/IntrinsicInst.h
-- Installing: /usr/local/include/llvm/IR/Intrinsics.h
-- Installing: /usr/local/include/llvm/IR/Intrinsics.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsAArch64.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsARM.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsHexagon.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsMips.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsNVVM.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsPowerPC.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsR600.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsX86.td
-- Installing: /usr/local/include/llvm/IR/IntrinsicsXCore.td
-- Installing: /usr/local/include/llvm/IR/LLVMContext.h
-- Installing: /usr/local/include/llvm/IR/LegacyPassManager.h
-- Installing: /usr/local/include/llvm/IR/LegacyPassManagers.h
-- Installing: /usr/local/include/llvm/IR/LegacyPassNameParser.h
-- Installing: /usr/local/include/llvm/IR/MDBuilder.h
-- Installing: /usr/local/include/llvm/IR/Mangler.h
-- Installing: /usr/local/include/llvm/IR/Metadata.def
-- Installing: /usr/local/include/llvm/IR/Metadata.h
-- Installing: /usr/local/include/llvm/IR/MetadataTracking.h
-- Installing: /usr/local/include/llvm/IR/Module.h
-- Installing: /usr/local/include/llvm/IR/NoFolder.h
-- Installing: /usr/local/include/llvm/IR/OperandTraits.h
-- Installing: /usr/local/include/llvm/IR/Operator.h
-- Installing: /usr/local/include/llvm/IR/PassManager.h
-- Installing: /usr/local/include/llvm/IR/PassManagerInternal.h
-- Installing: /usr/local/include/llvm/IR/PatternMatch.h
-- Installing: /usr/local/include/llvm/IR/PredIteratorCache.h
-- Installing: /usr/local/include/llvm/IR/Statepoint.h
-- Installing: /usr/local/include/llvm/IR/SymbolTableListTraits.h
-- Installing: /usr/local/include/llvm/IR/TrackingMDRef.h
-- Installing: /usr/local/include/llvm/IR/Type.h
-- Installing: /usr/local/include/llvm/IR/TypeBuilder.h
-- Installing: /usr/local/include/llvm/IR/TypeFinder.h
-- Installing: /usr/local/include/llvm/IR/Use.h
-- Installing: /usr/local/include/llvm/IR/UseListOrder.h
-- Installing: /usr/local/include/llvm/IR/User.h
-- Installing: /usr/local/include/llvm/IR/Value.h
-- Installing: /usr/local/include/llvm/IR/ValueHandle.h
-- Installing: /usr/local/include/llvm/IR/ValueMap.h
-- Installing: /usr/local/include/llvm/IR/ValueSymbolTable.h
-- Installing: /usr/local/include/llvm/IR/Verifier.h
-- Installing: /usr/local/include/llvm/IRReader
-- Installing: /usr/local/include/llvm/IRReader/IRReader.h
-- Installing: /usr/local/include/llvm/InitializePasses.h
-- Installing: /usr/local/include/llvm/LTO
-- Installing: /usr/local/include/llvm/LTO/LTOCodeGenerator.h
-- Installing: /usr/local/include/llvm/LTO/LTOModule.h
-- Installing: /usr/local/include/llvm/LineEditor
-- Installing: /usr/local/include/llvm/LineEditor/LineEditor.h
-- Installing: /usr/local/include/llvm/LinkAllIR.h
-- Installing: /usr/local/include/llvm/LinkAllPasses.h
-- Installing: /usr/local/include/llvm/Linker
-- Installing: /usr/local/include/llvm/Linker/Linker.h
-- Installing: /usr/local/include/llvm/MC
-- Installing: /usr/local/include/llvm/MC/ConstantPools.h
-- Installing: /usr/local/include/llvm/MC/MCAsmBackend.h
-- Installing: /usr/local/include/llvm/MC/MCAsmInfo.h
-- Installing: /usr/local/include/llvm/MC/MCAsmInfoCOFF.h
-- Installing: /usr/local/include/llvm/MC/MCAsmInfoDarwin.h
-- Installing: /usr/local/include/llvm/MC/MCAsmInfoELF.h
-- Installing: /usr/local/include/llvm/MC/MCAsmLayout.h

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-- Installing: /usr/local/include/llvm/MC/MCAssembler.h
-- Installing: /usr/local/include/llvm/MC/MCCodeEmitter.h
-- Installing: /usr/local/include/llvm/MC/MCCodeGenInfo.h
-- Installing: /usr/local/include/llvm/MC/MCContext.h
-- Installing: /usr/local/include/llvm/MC/MCDirectives.h
-- Installing: /usr/local/include/llvm/MC/MCDisassembler.h
-- Installing: /usr/local/include/llvm/MC/MCDwarf.h
-- Installing: /usr/local/include/llvm/MC/MCELF.h
-- Installing: /usr/local/include/llvm/MC/MCELFObjectWriter.h
-- Installing: /usr/local/include/llvm/MC/MCELFStreamer.h
-- Installing: /usr/local/include/llvm/MC/MCELFSymbolFlags.h
-- Installing: /usr/local/include/llvm/MC/MCExpr.h
-- Installing: /usr/local/include/llvm/MC/MCExternalSymbolizer.h
-- Installing: /usr/local/include/llvm/MC/MCFixedLenDisassembler.h
-- Installing: /usr/local/include/llvm/MC/MCFixup.h
-- Installing: /usr/local/include/llvm/MC/MCFixupKindInfo.h
-- Installing: /usr/local/include/llvm/MC/MCInst.h
-- Installing: /usr/local/include/llvm/MC/MCInstBuilder.h
-- Installing: /usr/local/include/llvm/MC/MCInstPrinter.h
-- Installing: /usr/local/include/llvm/MC/MCInstrAnalysis.h
-- Installing: /usr/local/include/llvm/MC/MCInstrDesc.h
-- Installing: /usr/local/include/llvm/MC/MCInstrInfo.h
-- Installing: /usr/local/include/llvm/MC/MCInstltnaries.h
-- Installing: /usr/local/include/llvm/MC/MCLabel.h
-- Installing: /usr/local/include/llvm/MC/MCLinkerOptimizationHint.h
-- Installing: /usr/local/include/llvm/MC/MCMachOSymbolFlags.h
-- Installing: /usr/local/include/llvm/MC/MCMachObjectWriter.h
-- Installing: /usr/local/include/llvm/MC/MCObjectFileInfo.h
-- Installing: /usr/local/include/llvm/MC/MCObjectStreamer.h
-- Installing: /usr/local/include/llvm/MC/MCObjectWriter.h
-- Installing: /usr/local/include/llvm/MC/MCParser
-- Installing: /usr/local/include/llvm/MC/MCParser/AsmCond.h
-- Installing: /usr/local/include/llvm/MC/MCParser/AsmLexer.h
-- Installing: /usr/local/include/llvm/MC/MCParser/MCAsmLexer.h
-- Installing: /usr/local/include/llvm/MC/MCParser/MCAsmParser.h
-- Installing: /usr/local/include/llvm/MC/MCParser/MCAsmParserExtension.h
-- Installing: /usr/local/include/llvm/MC/MCParser/MCParsedAsmOperand.h
-- Installing: /usr/local/include/llvm/MC/MCRegisterInfo.h
-- Installing: /usr/local/include/llvm/MC/MCRelocationInfo.h
-- Installing: /usr/local/include/llvm/MC/MCSchedule.h
-- Installing: /usr/local/include/llvm/MC/MCSection.h
-- Installing: /usr/local/include/llvm/MC/MCSectionCOFF.h
-- Installing: /usr/local/include/llvm/MC/MCSectionELF.h
-- Installing: /usr/local/include/llvm/MC/MCSectionMachO.h
-- Installing: /usr/local/include/llvm/MC/MCStreamer.h
-- Installing: /usr/local/include/llvm/MC/MCSubtargetInfo.h
-- Installing: /usr/local/include/llvm/MC/MCSymbol.h
-- Installing: /usr/local/include/llvm/MC/MCSymbolizer.h
-- Installing: /usr/local/include/llvm/MC/MCTargetAsmParser.h
-- Installing: /usr/local/include/llvm/MC/MCTargetOptions.h
-- Installing: /usr/local/include/llvm/MC/MCTargetOptionsCommandFlags.h
-- Installing: /usr/local/include/llvm/MC/MCValue.h
-- Installing: /usr/local/include/llvm/MC/MCWin64EH.h
-- Installing: /usr/local/include/llvm/MC/MCWinCOFFObjectWriter.h
-- Installing: /usr/local/include/llvm/MC/MCWinCOFFStreamer.h
-- Installing: /usr/local/include/llvm/MC/MCWinEH.h
-- Installing: /usr/local/include/llvm/MC/MachineLocation.h
-- Installing: /usr/local/include/llvm/MC/SectionKind.h
-- Installing: /usr/local/include/llvm/MC/StringTableBuilder.h
-- Installing: /usr/local/include/llvm/MC/SubtargetFeature.h
-- Installing: /usr/local/include/llvm/MC/YAML.h
-- Installing: /usr/local/include/llvm/Object
-- Installing: /usr/local/include/llvm/Object/Archive.h
-- Installing: /usr/local/include/llvm/Object/Binary.h
-- Installing: /usr/local/include/llvm/Object/COFF.h
-- Installing: /usr/local/include/llvm/Object/COFFYAML.h
-- Installing: /usr/local/include/llvm/Object/ELF.h
-- Installing: /usr/local/include/llvm/Object/ELFObjectFile.h
-- Installing: /usr/local/include/llvm/Object/ELFTypes.h
-- Installing: /usr/local/include/llvm/Object/ELFYAML.h
-- Installing: /usr/local/include/llvm/Object/Error.h
-- Installing: /usr/local/include/llvm/Object/IRObjectFile.h
-- Installing: /usr/local/include/llvm/Object/MachO.h

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-- Installing: /usr/local/include/llvm/Object/MachOUniversal.h
-- Installing: /usr/local/include/llvm/Object/ObjectFile.h
-- Installing: /usr/local/include/llvm/Object/RelocVisitor.h
-- Installing: /usr/local/include/llvm/Object/SymbolicFile.h
-- Installing: /usr/local/include/llvm/Option
-- Installing: /usr/local/include/llvm/Option/Arg.h
-- Installing: /usr/local/include/llvm/Option/ArgList.h
-- Installing: /usr/local/include/llvm/Option/OptParser.td
-- Installing: /usr/local/include/llvm/Option/OptSpecifier.h
-- Installing: /usr/local/include/llvm/Option/OptTable.h
-- Installing: /usr/local/include/llvm/Option/Option.h
-- Installing: /usr/local/include/llvm/Pass.h
-- Installing: /usr/local/include/llvm/PassAnalysisSupport.h
-- Installing: /usr/local/include/llvm/PassInfo.h
-- Installing: /usr/local/include/llvm/PassManager.h
-- Installing: /usr/local/include/llvm/PassRegistry.h
-- Installing: /usr/local/include/llvm/PassSupport.h
-- Installing: /usr/local/include/llvm/ProfileData
-- Installing: /usr/local/include/llvm/ProfileData/CoverageMapping.h
-- Installing: /usr/local/include/llvm/ProfileData/CoverageMappingReader.h
-- Installing: /usr/local/include/llvm/ProfileData/CoverageMappingWriter.h
-- Installing: /usr/local/include/llvm/ProfileData/InstrProf.h
-- Installing: /usr/local/include/llvm/ProfileData/InstrProfReader.h
-- Installing: /usr/local/include/llvm/ProfileData/InstrProfWriter.h
-- Installing: /usr/local/include/llvm/ProfileData/SampleProf.h
-- Installing: /usr/local/include/llvm/ProfileData/SampleProfReader.h
-- Installing: /usr/local/include/llvm/ProfileData/SampleProfWriter.h
-- Installing: /usr/local/include/llvm/Support
-- Installing: /usr/local/include/llvm/Support/AIXDataTypesFix.h
-- Installing: /usr/local/include/llvm/Support/ARMBuildAttributes.h
-- Installing: /usr/local/include/llvm/Support/ARMEHABI.h
-- Installing: /usr/local/include/llvm/Support/ARMWinEH.h
-- Installing: /usr/local/include/llvm/Support/AlignOf.h
-- Installing: /usr/local/include/llvm/Support/Allocator.h
-- Installing: /usr/local/include/llvm/Support/ArrayRecycler.h
-- Installing: /usr/local/include/llvm/Support/Atomic.h
-- Installing: /usr/local/include/llvm/Support/BlockFrequency.h
-- Installing: /usr/local/include/llvm/Support/BranchProbability.h
-- Installing: /usr/local/include/llvm/Support/CBindingWrapping.h
-- Installing: /usr/local/include/llvm/Support/COFF.h
-- Installing: /usr/local/include/llvm/Support/Capacity.h
-- Installing: /usr/local/include/llvm/Support/Casting.h
-- Installing: /usr/local/include/llvm/Support/CodeGen.h
-- Installing: /usr/local/include/llvm/Support/CommandLine.h
-- Installing: /usr/local/include/llvm/Support/Compiler.h
-- Installing: /usr/local/include/llvm/Support/Compression.h
-- Installing: /usr/local/include/llvm/Support/ConvertUTF.h
-- Installing: /usr/local/include/llvm/Support/CrashRecoveryContext.h
-- Installing: /usr/local/include/llvm/Support/DOTGraphTraits.h
-- Installing: /usr/local/include/llvm/Support/DataExtractor.h
-- Installing: /usr/local/include/llvm/Support/DataStream.h
-- Installing: /usr/local/include/llvm/Support/Debug.h
-- Installing: /usr/local/include/llvm/Support/Dwarf.h
-- Installing: /usr/local/include/llvm/Support/DynamicLibrary.h
-- Installing: /usr/local/include/llvm/Support/ELF.h
-- Installing: /usr/local/include/llvm/Support/ELFRelocs
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/AArch64.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/ARM.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/Hexagon.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/Mips.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/PowerPC.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/PowerPC64.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/Sparc.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/SystemZ.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/i386.def
-- Installing: /usr/local/include/llvm/Support/ELFRelocs/x86_64.def
-- Installing: /usr/local/include/llvm/Support/Endian.h
-- Installing: /usr/local/include/llvm/Support/EndianStream.h
-- Installing: /usr/local/include/llvm/Support/Errc.h
-- Installing: /usr/local/include/llvm/Support/Errno.h
-- Installing: /usr/local/include/llvm/Support/ErrorHandler.h
-- Installing: /usr/local/include/llvm/Support/ErrorOr.h
-- Installing: /usr/local/include/llvm/Support/FileOutputBuffer.h

-- Installing: /usr/local/include/llvm/Support/FileSystem.h
-- Installing: /usr/local/include/llvm/Support/FileUtilities.h
-- Installing: /usr/local/include/llvm/Support/Format.h
-- Installing: /usr/local/include/llvm/Support/FormattedStream.h
-- Installing: /usr/local/include/llvm/Support/GCOV.h
-- Installing: /usr/local/include/llvm/Support/GenericDomTree.h
-- Installing: /usr/local/include/llvm/Support/GenericDomTreeConstruction.h
-- Installing: /usr/local/include/llvm/Support/GraphWriter.h
-- Installing: /usr/local/include/llvm/Support/Host.h
-- Installing: /usr/local/include/llvm/Support/LEB128.h
-- Installing: /usr/local/include/llvm/Support/LICENSE.TXT
-- Installing: /usr/local/include/llvm/Support/LinIterator.h
-- Installing: /usr/local/include/llvm/Support/Locale.h
-- Installing: /usr/local/include/llvm/Support/LockFileManager.h
-- Installing: /usr/local/include/llvm/Support/MD5.h
-- Installing: /usr/local/include/llvm/Support/MachO.h
-- Installing: /usr/local/include/llvm/Support/ManagedStatic.h
-- Installing: /usr/local/include/llvm/Support/MathExtras.h
-- Installing: /usr/local/include/llvm/Support/Memory.h
-- Installing: /usr/local/include/llvm/Support/MemoryBuffer.h
-- Installing: /usr/local/include/llvm/Support/MemoryObject.h
-- Installing: /usr/local/include/llvm/Support/Mutex.h
-- Installing: /usr/local/include/llvm/Support/MutexGuard.h
-- Installing: /usr/local/include/llvm/Support/OnDiskHashTable.h
-- Installing: /usr/local/include/llvm/Support/Options.h
-- Installing: /usr/local/include/llvm/Support/OutputBuffer.h
-- Installing: /usr/local/include/llvm/Support/Path.h
-- Installing: /usr/local/include/llvm/Support/PluginLoader.h
-- Installing: /usr/local/include/llvm/Support/PointerLikeTypeTraits.h
-- Installing: /usr/local/include/llvm/Support/PrettyStackTrace.h
-- Installing: /usr/local/include/llvm/Support/Process.h
-- Installing: /usr/local/include/llvm/Support/Program.h
-- Installing: /usr/local/include/llvm/Support/RWMutex.h
-- Installing: /usr/local/include/llvm/Support/RandomNumberGenerator.h
-- Installing: /usr/local/include/llvm/Support/Recycler.h
-- Installing: /usr/local/include/llvm/Support/RecyclingAllocator.h
-- Installing: /usr/local/include/llvm/Support/Regex.h
-- Installing: /usr/local/include/llvm/Support/Registry.h
-- Installing: /usr/local/include/llvm/Support/RegistryParser.h
-- Installing: /usr/local/include/llvm/Support/SMLoc.h
-- Installing: /usr/local/include/llvm/Support/SaveAndRestore.h
-- Installing: /usr/local/include/llvm/Support/ScaledNumber.h
-- Installing: /usr/local/include/llvm/Support/Signals.h
-- Installing: /usr/local/include/llvm/Support/Solaris.h
-- Installing: /usr/local/include/llvm/Support/SourceMgr.h
-- Installing: /usr/local/include/llvm/Support/SpecialCaseList.h
-- Installing: /usr/local/include/llvm/Support/StreamingMemoryObject.h
-- Installing: /usr/local/include/llvm/Support/StringPool.h
-- Installing: /usr/local/include/llvm/Support/SwapByteOrder.h
-- Installing: /usr/local/include/llvm/Support/SystemUtils.h
-- Installing: /usr/local/include/llvm/Support/TargetRegistry.h
-- Installing: /usr/local/include/llvm/Support/TargetSelect.h
-- Installing: /usr/local/include/llvm/Support/ThreadLocal.h
-- Installing: /usr/local/include/llvm/Support/Threading.h
-- Installing: /usr/local/include/llvm/Support/TimeValue.h
-- Installing: /usr/local/include/llvm/Support/Timer.h
-- Installing: /usr/local/include/llvm/Support/ToolOutputFile.h
-- Installing: /usr/local/include/llvm/Support/Unicode.h
-- Installing: /usr/local/include/llvm/Support/UnicodeCharRanges.h
-- Installing: /usr/local/include/llvm/Support/UniqueLock.h
-- Installing: /usr/local/include/llvm/Support/Valgrind.h
-- Installing: /usr/local/include/llvm/Support/Watchdog.h
-- Installing: /usr/local/include/llvm/Support/Win64EH.h
-- Installing: /usr/local/include/llvm/Support/WindowsError.h
-- Installing: /usr/local/include/llvm/Support/YAMLParser.h
-- Installing: /usr/local/include/llvm/Support/YAMLTraits.h
-- Installing: /usr/local/include/llvm/Support/circular_raw_ostream.h
-- Installing: /usr/local/include/llvm/Support/raw_os_ostream.h
-- Installing: /usr/local/include/llvm/Support/raw_ostream.h
-- Installing: /usr/local/include/llvm/Support/type_traits.h
-- Installing: /usr/local/include/llvm/TableGen
-- Installing: /usr/local/include/llvm/TableGen/Error.h
-- Installing: /usr/local/include/llvm/TableGen/Main.h

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-- Installing: /usr/local/include/llvm/TableGen/Record.h
-- Installing: /usr/local/include/llvm/TableGen/SetTheory.h
-- Installing: /usr/local/include/llvm/TableGen/StringMatcher.h
-- Installing: /usr/local/include/llvm/TableGen/StringToOffsetTable.h
-- Installing: /usr/local/include/llvm/TableGen/TableGenBackend.h
-- Installing: /usr/local/include/llvm/Target
-- Installing: /usr/local/include/llvm/Target/CostTable.h
-- Installing: /usr/local/include/llvm/Target/Target.td
-- Installing: /usr/local/include/llvm/Target/TargetCallingConv.h
-- Installing: /usr/local/include/llvm/Target/TargetCallingConv.td
-- Installing: /usr/local/include/llvm/Target/TargetFrameLowering.h
-- Installing: /usr/local/include/llvm/Target/TargetInstrInfo.h
-- Installing: /usr/local/include/llvm/Target/TargetIntrinsicInfo.h
-- Installing: /usr/local/include/llvm/Target/TargetItinerary.td
-- Installing: /usr/local/include/llvm/Target/TargetLibraryInfo.h
-- Installing: /usr/local/include/llvm/Target/TargetLowering.h
-- Installing: /usr/local/include/llvm/Target/TargetLoweringObjectFile.h
-- Installing: /usr/local/include/llvm/Target/TargetMachine.h
-- Installing: /usr/local/include/llvm/Target/TargetOpcodes.h
-- Installing: /usr/local/include/llvm/Target/TargetOptions.h
-- Installing: /usr/local/include/llvm/Target/TargetRegisterInfo.h
-- Installing: /usr/local/include/llvm/Target/TargetSchedule.td
-- Installing: /usr/local/include/llvm/Target/TargetSelectionDAG.td
-- Installing: /usr/local/include/llvm/Target/TargetSelectionDAGInfo.h
-- Installing: /usr/local/include/llvm/Target/TargetSubtargetInfo.h
-- Installing: /usr/local/include/llvm/Transforms
-- Installing: /usr/local/include/llvm/Transforms/IPO.h
-- Installing: /usr/local/include/llvm/Transforms/IPO
-- Installing: /usr/local/include/llvm/Transforms/IPO/InlinerPass.h
-- Installing: /usr/local/include/llvm/Transforms/IPO/PassManagerBuilder.h
-- Installing: /usr/local/include/llvm/Transforms/Instrumentation.h
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation/BogusControlFlow.h
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation/Flattening.h
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation/Split.h
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation/Substitution.h
-- Installing: /usr/local/include/llvm/Transforms/Obfuscation/Utils.h
-- Installing: /usr/local/include/llvm/Transforms/ObjCARC.h
-- Installing: /usr/local/include/llvm/Transforms/Scalar.h
-- Installing: /usr/local/include/llvm/Transforms/Utils
-- Installing: /usr/local/include/llvm/Transforms/Utils/ASanStackFrameLayout.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/BasicBlockUtils.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/BuildLibCalls.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/BypassSlowDivision.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/Cloning.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/CmplInstAnalysis.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/CodeExtractor.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/CtorUtils.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/GlobalStatus.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/IntegerDivision.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/Local.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/LoopUtils.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/ModuleUtils.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/PromoteMemToReg.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/SSAUpdater.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/SSAUpdaterImpl.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/SimplifyIndVar.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/SimplifyLibCalls.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/SymbolRewriter.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/UnifyFunctionExitNodes.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/UnrollLoop.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/ValueMapper.h
-- Installing: /usr/local/include/llvm/Transforms/Utils/VectorUtils.h
-- Installing: /usr/local/include/llvm/Transforms/Vectorize.h
-- Installing: /usr/local/include/llvm-c
-- Installing: /usr/local/include/llvm-c/Analysis.h
-- Installing: /usr/local/include/llvm-c/BitReader.h
-- Installing: /usr/local/include/llvm-c/BitWriter.h
-- Installing: /usr/local/include/llvm-c/Core.h
-- Installing: /usr/local/include/llvm-c/Disassembler.h
-- Installing: /usr/local/include/llvm-c/ExecutionEngine.h
-- Installing: /usr/local/include/llvm-c/IRReader.h
-- Installing: /usr/local/include/llvm-c/Initialization.h

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-- Installing: /usr/local/include/llvm-c/LinkTimeOptimizer.h
-- Installing: /usr/local/include/llvm-c/Linker.h
-- Installing: /usr/local/include/llvm-c/Object.h
-- Installing: /usr/local/include/llvm-c/Support.h
-- Installing: /usr/local/include/llvm-c/Target.h
-- Installing: /usr/local/include/llvm-c/TargetMachine.h
-- Installing: /usr/local/include/llvm-c/Transforms
-- Installing: /usr/local/include/llvm-c/Transforms/IPO.h
-- Installing: /usr/local/include/llvm-c/Transforms/PassManagerBuilder.h
-- Installing: /usr/local/include/llvm-c/Transforms/Scalar.h
-- Installing: /usr/local/include/llvm-c/Transforms/Vectorize.h
-- Installing: /usr/local/include/llvm-c/lto.h
-- Up-to-date: /usr/local/include/llvm
-- Up-to-date: /usr/local/include/llvm/Config
-- Installing: /usr/local/include/llvm/Config/AsmPrinters.def
-- Installing: /usr/local/include/llvm/Config/AsmParsers.def
-- Installing: /usr/local/include/llvm/Config/Disassemblers.def
-- Installing: /usr/local/include/llvm/Config/Targets.def
-- Installing: /usr/local/include/llvm/Config/llvm-config.h
-- Up-to-date: /usr/local/include/llvm/Support
-- Installing: /usr/local/include/llvm/Support/DataTypes.h
-- Up-to-date: /usr/local/include/llvm/IR
-- Installing: /usr/local/include/llvm/IR/Intrinsics.gen
-- Installing: /usr/local/lib/libLLVMSupport.a
-- Installing: /usr/local/lib/libLLVMTableGen.a
-- Installing: /usr/local/bin/llvm-tblgen
-- Installing: /usr/local/lib/libLLVMCore.a
-- Installing: /usr/local/lib/libLLVMIRReader.a
-- Installing: /usr/local/lib/libLLVMCodeGen.a
-- Installing: /usr/local/lib/libLLVMSelectionDAG.a
-- Installing: /usr/local/lib/libLLVMAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMBitReader.a
-- Installing: /usr/local/lib/libLLVMBitWriter.a
-- Installing: /usr/local/lib/libLLVMTransformUtils.a
-- Installing: /usr/local/lib/libLLVMInstrumentation.a
-- Installing: /usr/local/lib/libLLVMInstCombine.a
-- Installing: /usr/local/lib/libLLVMScalarOpts.a
-- Installing: /usr/local/lib/libLLVMipo.a
-- Installing: /usr/local/lib/libLLVMVectorize.a
-- Installing: /usr/local/lib/LLVMHello.so
-- Installing: /usr/local/lib/libLLVMObjCARCOpts.a
-- Installing: /usr/local/lib/libLLVMObfuscation.a
-- Installing: /usr/local/lib/libLLVMLinker.a
-- Installing: /usr/local/lib/libLLVMAnalysis.a
-- Installing: /usr/local/lib/libLLVMipa.a
-- Installing: /usr/local/lib/libLLVMlto.a
-- Installing: /usr/local/lib/libLLVMMC.a
-- Installing: /usr/local/lib/libLLVMMCParser.a
-- Installing: /usr/local/lib/libLLVMMCDisassembler.a
-- Installing: /usr/local/lib/libLLVMObject.a
-- Installing: /usr/local/lib/libLLVMOption.a
-- Installing: /usr/local/lib/libLLVMDebugInfo.a
-- Installing: /usr/local/lib/libLLVMExecutionEngine.a
-- Installing: /usr/local/lib/libLLVMInterpreter.a
-- Installing: /usr/local/lib/libLLVMMCJIT.a
-- Installing: /usr/local/lib/libLLVMRuntimeDyld.a
-- Installing: /usr/local/lib/libLLVMTarget.a
-- Installing: /usr/local/lib/libLLVMAArch64CodeGen.a
-- Installing: /usr/local/lib/libLLVMAArch64Info.a
-- Installing: /usr/local/lib/libLLVMAArch64AsmParser.a
-- Installing: /usr/local/lib/libLLVMAArch64Disassembler.a
-- Installing: /usr/local/lib/libLLVMAArch64AsmPrinter.a
-- Installing: /usr/local/lib/libLLVMAArch64Desc.a
-- Installing: /usr/local/lib/libLLVMAArch64Utils.a
-- Installing: /usr/local/lib/libLLVMARMCodeGen.a
-- Installing: /usr/local/lib/libLLVMARMInfo.a
-- Installing: /usr/local/lib/libLLVMARMAsmParser.a
-- Installing: /usr/local/lib/libLLVMARMDisassembler.a
-- Installing: /usr/local/lib/libLLVMARMAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMARMDesc.a
-- Installing: /usr/local/lib/libLLVMCppBackendCodeGen.a
-- Installing: /usr/local/lib/libLLVMCppBackendInfo.a
-- Installing: /usr/local/lib/libLLVMHexagonCodeGen.a

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-- Installing: /usr/local/lib/libLLVMHexagonInfo.a
-- Installing: /usr/local/lib/libLLVMHexagonDesc.a
-- Installing: /usr/local/lib/libLLVMHexagonDisassembler.a
-- Installing: /usr/local/lib/libLLVMMipsCodeGen.a
-- Installing: /usr/local/lib/libLLVMMipsAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMMipsDisassembler.a
-- Installing: /usr/local/lib/libLLVMMipsInfo.a
-- Installing: /usr/local/lib/libLLVMMipsDesc.a
-- Installing: /usr/local/lib/libLLVMMipsAsmParser.a
-- Installing: /usr/local/lib/libLLVMMSP430CodeGen.a
-- Installing: /usr/local/lib/libLLVMMSP430AsmPrinter.a
-- Installing: /usr/local/lib/libLLVMMSP430Info.a
-- Installing: /usr/local/lib/libLLVMMSP430Desc.a
-- Installing: /usr/local/lib/libLLVMNVPTXCodeGen.a
-- Installing: /usr/local/lib/libLLVMNVPTXInfo.a
-- Installing: /usr/local/lib/libLLVMNVPTXAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMNVPTXDesc.a
-- Installing: /usr/local/lib/libLLVMPowerPCCodeGen.a
-- Installing: /usr/local/lib/libLLVMPowerPCAsmParser.a
-- Installing: /usr/local/lib/libLLVMPowerPCDisassembler.a
-- Installing: /usr/local/lib/libLLVMPowerPCAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMPowerPCInfo.a
-- Installing: /usr/local/lib/libLLVMPowerPCDesc.a
-- Installing: /usr/local/lib/libLLVMR600CodeGen.a
-- Installing: /usr/local/lib/libLLVMR600AsmParser.a
-- Installing: /usr/local/lib/libLLVMR600AsmPrinter.a
-- Installing: /usr/local/lib/libLLVMR600Info.a
-- Installing: /usr/local/lib/libLLVMR600Desc.a
-- Installing: /usr/local/lib/libLLVMSparcCodeGen.a
-- Installing: /usr/local/lib/libLLVMSparcInfo.a
-- Installing: /usr/local/lib/libLLVMSparcDesc.a
-- Installing: /usr/local/lib/libLLVMSparcAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMSparcAsmParser.a
-- Installing: /usr/local/lib/libLLVMSparcDisassembler.a
-- Installing: /usr/local/lib/libLLVMSystemZCodeGen.a
-- Installing: /usr/local/lib/libLLVMSystemZAsmParser.a
-- Installing: /usr/local/lib/libLLVMSystemZDisassembler.a
-- Installing: /usr/local/lib/libLLVMSystemZAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMSystemZInfo.a
-- Installing: /usr/local/lib/libLLVMSystemZDesc.a
-- Installing: /usr/local/lib/libLLVMX86CodeGen.a
-- Installing: /usr/local/lib/libLLVMX86AsmParser.a
-- Installing: /usr/local/lib/libLLVMX86Disassembler.a
-- Installing: /usr/local/lib/libLLVMX86AsmPrinter.a
-- Installing: /usr/local/lib/libLLVMX86Desc.a
-- Installing: /usr/local/lib/libLLVMX86Info.a
-- Installing: /usr/local/lib/libLLVMX86Utils.a
-- Installing: /usr/local/lib/libLLVMXCoreCodeGen.a
-- Installing: /usr/local/lib/libLLVMXCoreDisassembler.a
-- Installing: /usr/local/lib/libLLVMXCoreAsmPrinter.a
-- Installing: /usr/local/lib/libLLVMXCoreInfo.a
-- Installing: /usr/local/lib/libLLVMXCoreDesc.a
-- Installing: /usr/local/lib/libLLVMAsmParser.a
-- Installing: /usr/local/lib/libLLVMLineEditor.a
-- Installing: /usr/local/lib/libLLVMProfileData.a
-- Installing: /usr/local/lib/libgtest.a
-- Installing: /usr/local/lib/libgtest_main.a
-- Installing: /usr/local/bin/llvm-config
-- Installing: /usr/local/bin/opt
-- Installing: /usr/local/bin/llvm-as
-- Installing: /usr/local/bin/llvm-dis
-- Installing: /usr/local/bin/llvm-mc
-- Installing: /usr/local/bin/lld
-- Installing: /usr/local/bin/llvm-ar
Creating llvm-ranlib
-- Installing: /usr/local/bin/llvm-nm
-- Installing: /usr/local/bin/llvm-size
-- Installing: /usr/local/bin/llvm-cov
-- Installing: /usr/local/bin/llvm-profdata
-- Installing: /usr/local/bin/llvm-link
-- Installing: /usr/local/bin/lli
-- Installing: /usr/local/bin/llvm-extract
-- Installing: /usr/local/bin/llvm-diff

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-- Installing: /usr/local/bin/macho-dump
-- Installing: /usr/local/bin/llvm-objdump
-- Installing: /usr/local/bin/llvm-readobj
-- Installing: /usr/local/bin/llvm-rtdyld
-- Installing: /usr/local/bin/llvm-dwarfdump
-- Installing: /usr/local/bin/llvm-dsymutil
-- Installing: /usr/local/bin/llvm-vtabledump
-- Installing: /usr/local/bin/bugpoint
-- Installing: /usr/local/lib/BugpointPasses.so
-- Installing: /usr/local/bin/llvm-bcanalyzer
-- Installing: /usr/local/bin/llvm-stress
-- Installing: /usr/local/bin/llvm-mcmarkup
-- Installing: /usr/local/bin/verify-uselistorder
-- Installing: /usr/local/bin/llvm-symbolizer
-- Installing: /usr/local/bin/llvm-c-test
-- Installing: /usr/local/bin/obj2yaml
-- Installing: /usr/local/bin/yaml2obj
-- Installing: /usr/local/lib/libLTO.so
-- Up-to-date: /usr/local/include/llvm-c/lto.h
-- Installing: /usr/local/bin/llvm-lto
-- Installing: /usr/local/include/clang
-- Installing: /usr/local/include/clang/ARCMigrate
-- Installing: /usr/local/include/clang/ARCMigrate/ARCMT.h
-- Installing: /usr/local/include/clang/ARCMigrate/ARCMTActions.h
-- Installing: /usr/local/include/clang/ARCMigrate/FileRemapper.h
-- Installing: /usr/local/include/clang/AST
-- Installing: /usr/local/include/clang/AST/APValue.h
-- Installing: /usr/local/include/clang/AST/AST.h
-- Installing: /usr/local/include/clang/AST/ASTConsumer.h
-- Installing: /usr/local/include/clang/AST/ASTContext.h
-- Installing: /usr/local/include/clang/AST/ASTDiagnostic.h
-- Installing: /usr/local/include/clang/AST/ASTFwd.h
-- Installing: /usr/local/include/clang/AST/ASTImporter.h
-- Installing: /usr/local/include/clang/AST/ASTLambda.h
-- Installing: /usr/local/include/clang/AST/ASTMutationListener.h
-- Installing: /usr/local/include/clang/AST/ASTTypeTraits.h
-- Installing: /usr/local/include/clang/AST/ASTUnresolvedSet.h
-- Installing: /usr/local/include/clang/AST/ASTVector.h
-- Installing: /usr/local/include/clang/AST/Attr.h
-- Installing: /usr/local/include/clang/AST/AttrIterator.h
-- Installing: /usr/local/include/clang/AST/BaseSubobject.h
-- Installing: /usr/local/include/clang/AST/BuiltinTypes.def
-- Installing: /usr/local/include/clang/AST/CXXInheritance.h
-- Installing: /usr/local/include/clang/AST/CanonicalType.h
-- Installing: /usr/local/include/clang/AST/CharUnits.h
-- Installing: /usr/local/include/clang/AST/Comment.h
-- Installing: /usr/local/include/clang/AST/CommentBriefParser.h
-- Installing: /usr/local/include/clang/AST/CommentCommandTraits.h
-- Installing: /usr/local/include/clang/AST/CommentDiagnostic.h
-- Installing: /usr/local/include/clang/AST/CommentLexer.h
-- Installing: /usr/local/include/clang/AST/CommentParser.h
-- Installing: /usr/local/include/clang/AST/CommentSema.h
-- Installing: /usr/local/include/clang/AST/CommentVisitor.h
-- Installing: /usr/local/include/clang/AST/DataRecursiveASTVisitor.h
-- Installing: /usr/local/include/clang/AST/Decl.h
-- Installing: /usr/local/include/clang/AST/DeclAccessPair.h
-- Installing: /usr/local/include/clang/AST/DeclBase.h
-- Installing: /usr/local/include/clang/AST/DeclCXX.h
-- Installing: /usr/local/include/clang/AST/DeclContextInternals.h
-- Installing: /usr/local/include/clang/AST/DeclFriend.h
-- Installing: /usr/local/include/clang/AST/DeclGroup.h
-- Installing: /usr/local/include/clang/AST/DeclLookups.h
-- Installing: /usr/local/include/clang/AST/DeclObjC.h
-- Installing: /usr/local/include/clang/AST/DeclOpenMP.h
-- Installing: /usr/local/include/clang/AST/DeclTemplate.h
-- Installing: /usr/local/include/clang/AST/DeclVisitor.h
-- Installing: /usr/local/include/clang/AST/DeclarationName.h
-- Installing: /usr/local/include/clang/AST/DependentDiagnostic.h
-- Installing: /usr/local/include/clang/AST/EvaluatedExprVisitor.h
-- Installing: /usr/local/include/clang/AST/Expr.h
-- Installing: /usr/local/include/clang/AST/ExprCXX.h
-- Installing: /usr/local/include/clang/AST/ExprObjC.h
-- Installing: /usr/local/include/clang/AST/ExternalASTSource.h
```

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-- Installing: /usr/local/include/clang/AST/GlobalDecl.h
-- Installing: /usr/local/include/clang/AST/LambdaCapture.h
-- Installing: /usr/local/include/clang/AST/Mangle.h
-- Installing: /usr/local/include/clang/AST/MangleNumberingContext.h
-- Installing: /usr/local/include/clang/AST/NSAPI.h
-- Installing: /usr/local/include/clang/AST/NestedNameSpecifier.h
-- Installing: /usr/local/include/clang/AST/OpenMPClause.h
-- Installing: /usr/local/include/clang/AST/OperationKinds.h
-- Installing: /usr/local/include/clang/AST/ParentMap.h
-- Installing: /usr/local/include/clang/AST/PrettyPrinter.h
-- Installing: /usr/local/include/clang/AST/RawCommentList.h
-- Installing: /usr/local/include/clang/AST/RecordLayout.h
-- Installing: /usr/local/include/clang/AST/RecursiveASTVisitor.h
-- Installing: /usr/local/include/clang/AST/Redeclarable.h
-- Installing: /usr/local/include/clang/AST/SelectorLocationsKind.h
-- Installing: /usr/local/include/clang/AST/Stmt.h
-- Installing: /usr/local/include/clang/AST/StmtCXX.h
-- Installing: /usr/local/include/clang/AST/StmtGraphTraits.h
-- Installing: /usr/local/include/clang/AST/StmtIterator.h
-- Installing: /usr/local/include/clang/AST/StmtObjC.h
-- Installing: /usr/local/include/clang/AST/StmtOpenMP.h
-- Installing: /usr/local/include/clang/AST/StmtVisitor.h
-- Installing: /usr/local/include/clang/AST/TemplateBase.h
-- Installing: /usr/local/include/clang/AST/TemplateName.h
-- Installing: /usr/local/include/clang/AST/Type.h
-- Installing: /usr/local/include/clang/AST/TypeLoc.h
-- Installing: /usr/local/include/clang/AST/TypeLocNodes.def
-- Installing: /usr/local/include/clang/AST/TypeLocVisitor.h
-- Installing: /usr/local/include/clang/AST/TypeNodes.def
-- Installing: /usr/local/include/clang/AST/TypeOrdering.h
-- Installing: /usr/local/include/clang/AST/TypeVisitor.h
-- Installing: /usr/local/include/clang/AST/UnresolvedSet.h
-- Installing: /usr/local/include/clang/AST/VTBuilder.h
-- Installing: /usr/local/include/clang/AST/VTableBuilder.h
-- Installing: /usr/local/include/clang/ASTMatchers
-- Installing: /usr/local/include/clang/ASTMatchers/ASTMatchFinder.h
-- Installing: /usr/local/include/clang/ASTMatchers/ASTMatchers.h
-- Installing: /usr/local/include/clang/ASTMatchers/ASTMatchersInternal.h
-- Installing: /usr/local/include/clang/ASTMatchers/ASTMatchersMacros.h
-- Installing: /usr/local/include/clang/ASTMatchers/Dynamic
-- Installing: /usr/local/include/clang/ASTMatchers/Dynamic/Diagnostics.h
-- Installing: /usr/local/include/clang/ASTMatchers/Dynamic/Parser.h
-- Installing: /usr/local/include/clang/ASTMatchers/Dynamic/Registry.h
-- Installing: /usr/local/include/clang/ASTMatchers/Dynamic/VariantValue.h
-- Installing: /usr/local/include/clang/Analysis
-- Installing: /usr/local/include/clang/Analysis/Analyses
-- Installing: /usr/local/include/clang/Analysis/Analyses/CFGReachabilityAnalysis.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/Consumed.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/Dominators.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/FormatString.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/LiveVariables.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/PostOrderCFGView.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/PseudoConstantAnalysis.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ReachableCode.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafety.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyCommon.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyLogical.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyOps.def
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyTIL.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyTraverse.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/ThreadSafetyUtil.h
-- Installing: /usr/local/include/clang/Analysis/Analyses/UninitializedValues.h
-- Installing: /usr/local/include/clang/Analysis/AnalysisContext.h
-- Installing: /usr/local/include/clang/Analysis/AnalysisDiagnostic.h
-- Installing: /usr/local/include/clang/Analysis/CFG.h
-- Installing: /usr/local/include/clang/Analysis/CFGStmtMap.h
-- Installing: /usr/local/include/clang/Analysis/CallGraph.h
-- Installing: /usr/local/include/clang/Analysis/CodeInjector.h
-- Installing: /usr/local/include/clang/Analysis/DomainSpecific
-- Installing: /usr/local/include/clang/Analysis/DomainSpecific/CocoaConventions.h
-- Installing: /usr/local/include/clang/Analysis/DomainSpecific/ObjCNoReturn.h
-- Installing: /usr/local/include/clang/Analysis/FlowSensitive
-- Installing: /usr/local/include/clang/Analysis/FlowSensitive/DataflowValues.h
```

-- Installing: /usr/local/include/clang/Analysis/ProgramPoint.h
-- Installing: /usr/local/include/clang/Analysis/Support
-- Installing: /usr/local/include/clang/Analysis/Support/BumpVector.h
-- Installing: /usr/local/include/clang/Basic
-- Installing: /usr/local/include/clang/Basic/ABI.h
-- Installing: /usr/local/include/clang/Basic/AddressSpaces.h
-- Installing: /usr/local/include/clang/Basic/AllDiagnostics.h
-- Installing: /usr/local/include/clang/Basic/AttrKinds.h
-- Installing: /usr/local/include/clang/Basic/Attributes.h
-- Installing: /usr/local/include/clang/Basic/Builtins.def
-- Installing: /usr/local/include/clang/Basic/Builtins.h
-- Installing: /usr/local/include/clang/Basic/BuiltinsAArch64.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsARM.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsHexagon.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsLe64.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsMips.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsNEON.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsNVPTX.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsPPC.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsR600.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsX86.def
-- Installing: /usr/local/include/clang/Basic/BuiltinsXCore.def
-- Installing: /usr/local/include/clang/Basic/CapturedStmt.h
-- Installing: /usr/local/include/clang/Basic/CharInfo.h
-- Installing: /usr/local/include/clang/Basic/CommentOptions.h
-- Installing: /usr/local/include/clang/Basic/Diagnostic.h
-- Installing: /usr/local/include/clang/Basic/DiagnosticCategories.h
-- Installing: /usr/local/include/clang/Basic/DiagnosticIDs.h
-- Installing: /usr/local/include/clang/Basic/DiagnosticOptions.def
-- Installing: /usr/local/include/clang/Basic/DiagnosticOptions.h
-- Installing: /usr/local/include/clang/Basic/ExceptionSpecificationType.h
-- Installing: /usr/local/include/clang/Basic/ExpressionTraits.h
-- Installing: /usr/local/include/clang/Basic/FileManager.h
-- Installing: /usr/local/include/clang/Basic/FileSystemOptions.h
-- Installing: /usr/local/include/clang/Basic/FileSystemStatCache.h
-- Installing: /usr/local/include/clang/Basic/IdentifierTable.h
-- Installing: /usr/local/include/clang/Basic/LLVM.h
-- Installing: /usr/local/include/clang/Basic/Lambda.h
-- Installing: /usr/local/include/clang/Basic/LangOptions.def
-- Installing: /usr/local/include/clang/Basic/LangOptions.h
-- Installing: /usr/local/include/clang/Basic/Linkage.h
-- Installing: /usr/local/include/clang/Basic/MacroBuilder.h
-- Installing: /usr/local/include/clang/Basic/Module.h
-- Installing: /usr/local/include/clang/Basic/ObjCRuntime.h
-- Installing: /usr/local/include/clang/Basic/OpenCLExtensions.def
-- Installing: /usr/local/include/clang/Basic/OpenMPKinds.def
-- Installing: /usr/local/include/clang/Basic/OpenMPKinds.h
-- Installing: /usr/local/include/clang/Basic/OperatorKinds.def
-- Installing: /usr/local/include/clang/Basic/OperatorKinds.h
-- Installing: /usr/local/include/clang/Basic/OperatorPrecedence.h
-- Installing: /usr/local/include/clang/Basic/PartialDiagnostic.h
-- Installing: /usr/local/include/clang/Basic/PlistSupport.h
-- Installing: /usr/local/include/clang/Basic/PrettyStackTrace.h
-- Installing: /usr/local/include/clang/Basic/SanitizerBlacklist.h
-- Installing: /usr/local/include/clang/Basic/Sanitizers.def
-- Installing: /usr/local/include/clang/Basic/Sanitizers.h
-- Installing: /usr/local/include/clang/Basic/SourceLocation.h
-- Installing: /usr/local/include/clang/Basic/SourceManager.h
-- Installing: /usr/local/include/clang/Basic/SourceManagerInternals.h
-- Installing: /usr/local/include/clang/Basic/Specifiers.h
-- Installing: /usr/local/include/clang/Basic/TargetBuiltins.h
-- Installing: /usr/local/include/clang/Basic/TargetCXXABI.h
-- Installing: /usr/local/include/clang/Basic/TargetInfo.h
-- Installing: /usr/local/include/clang/Basic/TargetOptions.h
-- Installing: /usr/local/include/clang/Basic/TemplateKinds.h
-- Installing: /usr/local/include/clang/Basic/TokenKinds.def
-- Installing: /usr/local/include/clang/Basic/TokenKinds.h
-- Installing: /usr/local/include/clang/Basic/TypeTraits.h
-- Installing: /usr/local/include/clang/Basic/Version.h
-- Installing: /usr/local/include/clang/Basic/VersionTuple.h
-- Installing: /usr/local/include/clang/Basic/VirtualFileSystem.h
-- Installing: /usr/local/include/clang/Basic/Visibility.h
-- Installing: /usr/local/include/clang/CodeGen

-- Installing: /usr/local/include/clang/CodeGen/BackendUtil.h
-- Installing: /usr/local/include/clang/CodeGen/CGFunctionInfo.h
-- Installing: /usr/local/include/clang/CodeGen/CodeGenABITypes.h
-- Installing: /usr/local/include/clang/CodeGen/CodeGenAction.h
-- Installing: /usr/local/include/clang/CodeGen/ModuleBuilder.h
-- Installing: /usr/local/include/clang/Config
-- Installing: /usr/local/include/clang/Driver
-- Installing: /usr/local/include/clang/Driver/Action.h
-- Installing: /usr/local/include/clang/Driver/Compilation.h
-- Installing: /usr/local/include/clang/Driver/Driver.h
-- Installing: /usr/local/include/clang/Driver/DriverDiagnostic.h
-- Installing: /usr/local/include/clang/Driver/Job.h
-- Installing: /usr/local/include/clang/Driver/Multilib.h
-- Installing: /usr/local/include/clang/Driver/Options.h
-- Installing: /usr/local/include/clang/Driver/Phases.h
-- Installing: /usr/local/include/clang/Driver/SanitizerArgs.h
-- Installing: /usr/local/include/clang/Driver/Tool.h
-- Installing: /usr/local/include/clang/Driver/ToolChain.h
-- Installing: /usr/local/include/clang/Driver/Types.def
-- Installing: /usr/local/include/clang/Driver/Types.h
-- Installing: /usr/local/include/clang/Driver/Util.h
-- Installing: /usr/local/include/clang/Edit
-- Installing: /usr/local/include/clang/Edit/Commit.h
-- Installing: /usr/local/include/clang/Edit/EditedSource.h
-- Installing: /usr/local/include/clang/Edit/EditsReceiver.h
-- Installing: /usr/local/include/clang/Edit/FileOffset.h
-- Installing: /usr/local/include/clang/Edit/Rewriters.h
-- Installing: /usr/local/include/clang/Format
-- Installing: /usr/local/include/clang/Format/Format.h
-- Installing: /usr/local/include/clang/Frontend
-- Installing: /usr/local/include/clang/Frontend/ASTConsumers.h
-- Installing: /usr/local/include/clang/Frontend/ASTUnit.h
-- Installing: /usr/local/include/clang/Frontend/ChainedDiagnosticConsumer.h
-- Installing: /usr/local/include/clang/Frontend/CodeGenOptions.def
-- Installing: /usr/local/include/clang/Frontend/CodeGenOptions.h
-- Installing: /usr/local/include/clang/Frontend/CommandLineSourceLoc.h
-- Installing: /usr/local/include/clang/Frontend/CompilerInstance.h
-- Installing: /usr/local/include/clang/Frontend/CompilerInvocation.h
-- Installing: /usr/local/include/clang/Frontend/DependencyOutputOptions.h
-- Installing: /usr/local/include/clang/Frontend/DiagnosticRenderer.h
-- Installing: /usr/local/include/clang/Frontend/FrontendAction.h
-- Installing: /usr/local/include/clang/Frontend/FrontendActions.h
-- Installing: /usr/local/include/clang/Frontend/FrontendDiagnostic.h
-- Installing: /usr/local/include/clang/Frontend/FrontendOptions.h
-- Installing: /usr/local/include/clang/Frontend/FrontendPluginRegistry.h
-- Installing: /usr/local/include/clang/Frontend/LangStandard.h
-- Installing: /usr/local/include/clang/Frontend/LangStandards.def
-- Installing: /usr/local/include/clang/Frontend/LayoutOverrideSource.h
-- Installing: /usr/local/include/clang/Frontend/LogDiagnosticPrinter.h
-- Installing: /usr/local/include/clang/Frontend/MigratorOptions.h
-- Installing: /usr/local/include/clang/Frontend/MultiplexConsumer.h
-- Installing: /usr/local/include/clang/Frontend/PreprocessorOutputOptions.h
-- Installing: /usr/local/include/clang/Frontend/SerializedDiagnosticPrinter.h
-- Installing: /usr/local/include/clang/Frontend/SerializedDiagnosticReader.h
-- Installing: /usr/local/include/clang/Frontend/SerializedDiagnostics.h
-- Installing: /usr/local/include/clang/Frontend/TextDiagnostic.h
-- Installing: /usr/local/include/clang/Frontend/TextDiagnosticBuffer.h
-- Installing: /usr/local/include/clang/Frontend/TextDiagnosticPrinter.h
-- Installing: /usr/local/include/clang/Frontend/Utils.h
-- Installing: /usr/local/include/clang/Frontend/VerifyDiagnosticConsumer.h
-- Installing: /usr/local/include/clang/FrontendTool
-- Installing: /usr/local/include/clang/FrontendTool/Utils.h
-- Installing: /usr/local/include/clang/Index
-- Installing: /usr/local/include/clang/Index/CommentToXML.h
-- Installing: /usr/local/include/clang/Index/USRGeneration.h
-- Installing: /usr/local/include/clang/Lex
-- Installing: /usr/local/include/clang/Lex/CodeCompletionHandler.h
-- Installing: /usr/local/include/clang/Lex/DirectoryLookup.h
-- Installing: /usr/local/include/clang/Lex/ExternalPreprocessorSource.h
-- Installing: /usr/local/include/clang/Lex/HeaderMap.h
-- Installing: /usr/local/include/clang/Lex/HeaderSearch.h
-- Installing: /usr/local/include/clang/Lex/HeaderSearchOptions.h
-- Installing: /usr/local/include/clang/Lex/LexDiagnostic.h

-- Installing: /usr/local/include/clang/Lex/Lexer.h
-- Installing: /usr/local/include/clang/Lex/LiteralSupport.h
-- Installing: /usr/local/include/clang/Lex/MacroArgs.h
-- Installing: /usr/local/include/clang/Lex/MacroInfo.h
-- Installing: /usr/local/include/clang/Lex/ModuleLoader.h
-- Installing: /usr/local/include/clang/Lex/ModuleMap.h
-- Installing: /usr/local/include/clang/Lex/MultipleIncludeOpt.h
-- Installing: /usr/local/include/clang/Lex/PPCallbacks.h
-- Installing: /usr/local/include/clang/Lex/PPConditionalDirectiveRecord.h
-- Installing: /usr/local/include/clang/Lex/PTHLexer.h
-- Installing: /usr/local/include/clang/Lex/PTHManager.h
-- Installing: /usr/local/include/clang/Lex/Pragma.h
-- Installing: /usr/local/include/clang/Lex/PreprocessingRecord.h
-- Installing: /usr/local/include/clang/Lex/Preprocessor.h
-- Installing: /usr/local/include/clang/Lex/PreprocessorLexer.h
-- Installing: /usr/local/include/clang/Lex/PreprocessorOptions.h
-- Installing: /usr/local/include/clang/Lex/ScratchBuffer.h
-- Installing: /usr/local/include/clang/Lex/Token.h
-- Installing: /usr/local/include/clang/Lex/TokenConcatenation.h
-- Installing: /usr/local/include/clang/Lex/TokenLexer.h
-- Installing: /usr/local/include/clang/Parse
-- Installing: /usr/local/include/clang/Parse/ParseAST.h
-- Installing: /usr/local/include/clang/Parse/ParseDiagnostic.h
-- Installing: /usr/local/include/clang/Parse/Parser.h
-- Installing: /usr/local/include/clang/Rewrite
-- Installing: /usr/local/include/clang/Rewrite/Core
-- Installing: /usr/local/include/clang/Rewrite/Core/DeltaTree.h
-- Installing: /usr/local/include/clang/Rewrite/Core/HTMLRewrite.h
-- Installing: /usr/local/include/clang/Rewrite/Core/RewriteRope.h
-- Installing: /usr/local/include/clang/Rewrite/Core/Rewriter.h
-- Installing: /usr/local/include/clang/Rewrite/Core/TokenRewriter.h
-- Installing: /usr/local/include/clang/Rewrite/Frontend
-- Installing: /usr/local/include/clang/Rewrite/Frontend/ASTConsumers.h
-- Installing: /usr/local/include/clang/Rewrite/Frontend/FixItRewriter.h
-- Installing: /usr/local/include/clang/Rewrite/Frontend/FrontendActions.h
-- Installing: /usr/local/include/clang/Rewrite/Frontend/Rewriters.h
-- Installing: /usr/local/include/clang/Sema
-- Installing: /usr/local/include/clang/Sema/AnalysisBasedWarnings.h
-- Installing: /usr/local/include/clang/Sema/AttributeList.h
-- Installing: /usr/local/include/clang/Sema/CXXFieldCollector.h
-- Installing: /usr/local/include/clang/Sema/CodeCompleteConsumer.h
-- Installing: /usr/local/include/clang/Sema/CodeCompleteOptions.h
-- Installing: /usr/local/include/clang/Sema/DeclSpec.h
-- Installing: /usr/local/include/clang/Sema/DelayedDiagnostic.h
-- Installing: /usr/local/include/clang/Sema/Designator.h
-- Installing: /usr/local/include/clang/Sema/ExternalSemaSource.h
-- Installing: /usr/local/include/clang/Sema/IdentifierResolver.h
-- Installing: /usr/local/include/clang/Sema/Initialization.h
-- Installing: /usr/local/include/clang/Sema/LocInfoType.h
-- Installing: /usr/local/include/clang/Sema/Lookup.h
-- Installing: /usr/local/include/clang/Sema/LoopHint.h
-- Installing: /usr/local/include/clang/Sema/MultiplexExternalSemaSource.h
-- Installing: /usr/local/include/clang/Sema/ObjCMethodList.h
-- Installing: /usr/local/include/clang/Sema/Overload.h
-- Installing: /usr/local/include/clang/Sema/Ownership.h
-- Installing: /usr/local/include/clang/Sema/ParsedTemplate.h
-- Installing: /usr/local/include/clang/Sema/PrettyDeclStackTrace.h
-- Installing: /usr/local/include/clang/Sema/Scope.h
-- Installing: /usr/local/include/clang/Sema/ScopeInfo.h
-- Installing: /usr/local/include/clang/Sema/Sema.h
-- Installing: /usr/local/include/clang/Sema/SemaConsumer.h
-- Installing: /usr/local/include/clang/Sema/SemaDiagnostic.h
-- Installing: /usr/local/include/clang/Sema/SemaFixItUtils.h
-- Installing: /usr/local/include/clang/Sema/SemaInternal.h
-- Installing: /usr/local/include/clang/Sema/SemaLambda.h
-- Installing: /usr/local/include/clang/Sema/Template.h
-- Installing: /usr/local/include/clang/Sema/TemplateDeduction.h
-- Installing: /usr/local/include/clang/Sema/TypoCorrection.h
-- Installing: /usr/local/include/clang/Sema/Weak.h
-- Installing: /usr/local/include/clang/Serialization
-- Installing: /usr/local/include/clang/Serialization/ASTBitCodes.h
-- Installing: /usr/local/include/clang/Serialization/ASTDeserializationListener.h
-- Installing: /usr/local/include/clang/Serialization/ASTReader.h

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-- Installing: /usr/local/include/clang/Serialization/ASTWriter.h
-- Installing: /usr/local/include/clang/Serialization/ContinuousRangeMap.h
-- Installing: /usr/local/include/clang/Serialization/GlobalModuleIndex.h
-- Installing: /usr/local/include/clang/Serialization/Module.h
-- Installing: /usr/local/include/clang/Serialization/ModuleManager.h
-- Installing: /usr/local/include/clang/Serialization/SerializationDiagnostic.h
-- Installing: /usr/local/include/clang/StaticAnalyzer
-- Installing: /usr/local/include/clang/StaticAnalyzer/Checkers
-- Installing: /usr/local/include/clang/StaticAnalyzer/Checkers/ClangCheckers.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Checkers/LocalCheckers.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Checkers/ObjCRetainCount.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/Analyses.def
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/AnalyzerOptions.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter/BugReporter.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter/BugReporterVisitor.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter/BugType.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter/CommonBugCategories.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/BugReporter/PathDiagnostic.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/Checker.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/CheckerManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/CheckerOptInfo.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/CheckerRegistry.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathDiagnosticConsumers.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/APSIntType.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/AnalysisManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/BasicValueFactory.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/BlockCounter.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/CallEvent.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/CheckerContext.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/CheckerHelpers.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ConstraintManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/CoreEngine.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/DynamicTypeInfo.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/Environment.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ExplodedGraph.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ExprEngine.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/FunctionSummary.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/MemRegion.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ProgramState.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ProgramStateTrait.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/ProgramState_Fwd.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/SValBuilder.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/SVals.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/Store.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/StoreRef.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/SubEngine.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/SummaryManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/SymbolManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/TaintManager.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/TaintTag.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Core/PathSensitive/WorkList.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Frontend
-- Installing: /usr/local/include/clang/StaticAnalyzer/Frontend/AnalysisConsumer.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Frontend/CheckerRegistration.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Frontend/FrontendActions.h
-- Installing: /usr/local/include/clang/StaticAnalyzer/Frontend/ModelConsumer.h
-- Installing: /usr/local/include/clang/Tooling
-- Installing: /usr/local/include/clang/Tooling/ArgumentsAdjusters.h
-- Installing: /usr/local/include/clang/Tooling/CommonOptionsParser.h
-- Installing: /usr/local/include/clang/Tooling/CompilationDatabase.h
-- Installing: /usr/local/include/clang/Tooling/CompilationDatabasePluginRegistry.h
-- Installing: /usr/local/include/clang/Tooling/Core
-- Installing: /usr/local/include/clang/Tooling/Core/Replacement.h
-- Installing: /usr/local/include/clang/Tooling/FileMatchTrie.h
-- Installing: /usr/local/include/clang/Tooling/JSONCompilationDatabase.h
-- Installing: /usr/local/include/clang/Tooling/Refactoring.h
-- Installing: /usr/local/include/clang/Tooling/RefactoringCallbacks.h
-- Installing: /usr/local/include/clang/Tooling/ReplacementsYaml.h
-- Installing: /usr/local/include/clang/Tooling/Tooling.h
-- Installing: /usr/local/include/clang-c

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-- Installing: /usr/local/include/clang-c/BuildSystem.h
-- Installing: /usr/local/include/clang-c/CXCompilationDatabase.h
-- Installing: /usr/local/include/clang-c/CXErrorCode.h
-- Installing: /usr/local/include/clang-c/CXString.h
-- Installing: /usr/local/include/clang-c/Documentation.h
-- Installing: /usr/local/include/clang-c/Index.h
-- Installing: /usr/local/include/clang-c/Platform.h
-- Up-to-date: /usr/local/include/clang
-- Up-to-date: /usr/local/include/clang/Basic
-- Installing: /usr/local/include/clang/Basic/Version.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticCommonKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticIndexName.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticDriverKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticParseKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticCommentKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticGroups.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticASTKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticSerializationKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticLexKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticSemaKinds.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticAnalysisKinds.inc
-- Installing: /usr/local/include/clang/Basic/AttrList.inc
-- Installing: /usr/local/include/clang/Basic/DiagnosticFrontendKinds.inc
-- Installing: /usr/local/include/clang/Basic/AttrHasAttributeImpl.inc
-- Installing: /usr/local/include/clang/Basic/arm_neon.inc
-- Up-to-date: /usr/local/include/clang/Config
-- Up-to-date: /usr/local/include/clang/AST
-- Installing: /usr/local/include/clang/AST/CommentCommandList.inc
-- Installing: /usr/local/include/clang/AST/CommentCommandInfo.inc
-- Installing: /usr/local/include/clang/AST/Attrs.inc
-- Installing: /usr/local/include/clang/AST/AttrImpl.inc
-- Installing: /usr/local/include/clang/AST/AttrDump.inc
-- Installing: /usr/local/include/clang/AST/AttrVisitor.inc
-- Installing: /usr/local/include/clang/AST/CommentHTMLNamedCharacterReferences.inc
-- Installing: /usr/local/include/clang/AST/StmtNodes.inc
-- Installing: /usr/local/include/clang/AST/DeclNodes.inc
-- Installing: /usr/local/include/clang/AST/CommentNodes.inc
-- Installing: /usr/local/include/clang/AST/CommentHTMLTagsProperties.inc
-- Installing: /usr/local/include/clang/AST/CommentHTMLTags.inc
-- Up-to-date: /usr/local/include/clang/Driver
-- Installing: /usr/local/include/clang/Driver/Options.inc
-- Up-to-date: /usr/local/include/clang/Parse
-- Installing: /usr/local/include/clang/Parse/AttrParserStringSwitches.inc
-- Up-to-date: /usr/local/include/clang/Sema
-- Installing: /usr/local/include/clang/Sema/AttrSpellingListIndex.inc
-- Installing: /usr/local/include/clang/Sema/AttrParsedAttrList.inc
-- Installing: /usr/local/include/clang/Sema/AttrParsedAttrKinds.inc
-- Installing: /usr/local/include/clang/Sema/AttrParsedAttrImpl.inc
-- Installing: /usr/local/include/clang/Sema/AttrTemplateInstantiate.inc
-- Up-to-date: /usr/local/include/clang/Serialization
-- Installing: /usr/local/include/clang/Serialization/AttrPCHRead.inc
-- Installing: /usr/local/include/clang/Serialization/AttrPCHWrite.inc
-- Up-to-date: /usr/local/include/clang-c
-- Up-to-date: /usr/local/include/clang-c/BuildSystem.h
-- Up-to-date: /usr/local/include/clang-c/CXCompilationDatabase.h
-- Up-to-date: /usr/local/include/clang-c/CXErrorCode.h
-- Up-to-date: /usr/local/include/clang-c/CXString.h
-- Up-to-date: /usr/local/include/clang-c/Documentation.h
-- Up-to-date: /usr/local/include/clang-c/Index.h
-- Up-to-date: /usr/local/include/clang-c/Platform.h
-- Installing: /usr/local/lib/clang/3.6.1/include/adxintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/altivec.h
-- Installing: /usr/local/lib/clang/3.6.1/include/ammintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/arm_ae6le.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx2intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx512bwintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx512erintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx512fintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx512vbwintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avx512vlintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/avxintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/bmi2intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/bmiintrin.h

```

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-- Installing: /usr/local/lib/clang/3.6.1/include/cpuid.h
-- Installing: /usr/local/lib/clang/3.6.1/include/emmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/f16cintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/float.h
-- Installing: /usr/local/lib/clang/3.6.1/include/fma4intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/fmaintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/ia32intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/immintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/iso646.h
-- Installing: /usr/local/lib/clang/3.6.1/include/limits.h
-- Installing: /usr/local/lib/clang/3.6.1/include/lzcntintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/mm3dnow.h
-- Installing: /usr/local/lib/clang/3.6.1/include/mmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/mm_malloc.h
-- Installing: /usr/local/lib/clang/3.6.1/include/module.modulemap
-- Installing: /usr/local/lib/clang/3.6.1/include/nmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/pmmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/popcntintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/prfchwintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/rdseedintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/rtmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/shaintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/smmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdalign.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdarg.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdatomic.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdbool.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stddef.h
-- Installing: /usr/local/lib/clang/3.6.1/include/_stddef_max_align_t.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdint.h
-- Installing: /usr/local/lib/clang/3.6.1/include/stdnoreturn.h
-- Installing: /usr/local/lib/clang/3.6.1/include/tbmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/tgmmath.h
-- Installing: /usr/local/lib/clang/3.6.1/include/tmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/unwind.h
-- Installing: /usr/local/lib/clang/3.6.1/include/vadefs.h
-- Installing: /usr/local/lib/clang/3.6.1/include/varargs.h
-- Installing: /usr/local/lib/clang/3.6.1/include/_wmmmintrin_aes.h
-- Installing: /usr/local/lib/clang/3.6.1/include/wmmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/_wmmmintrin_pclmul.h
-- Installing: /usr/local/lib/clang/3.6.1/include/x86intrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/xmmmintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/xopintrin.h
-- Installing: /usr/local/lib/clang/3.6.1/include/arm_neon.h
-- Installing: /usr/local/lib/libclangBasic.a
-- Installing: /usr/local/lib/libclangLex.a
-- Installing: /usr/local/lib/libclangParse.a
-- Installing: /usr/local/lib/libclangAST.a
-- Installing: /usr/local/lib/libclangASTMatchers.a
-- Installing: /usr/local/lib/libclangDynamicASTMatchers.a
-- Installing: /usr/local/lib/libclangSema.a
-- Installing: /usr/local/lib/libclangCodeGen.a
-- Installing: /usr/local/lib/libclangAnalysis.a
-- Installing: /usr/local/lib/libclangEdit.a
-- Installing: /usr/local/lib/libclangRewrite.a
-- Installing: /usr/local/lib/libclangARCMigrate.a
-- Installing: /usr/local/lib/libclangDriver.a
-- Installing: /usr/local/lib/libclangSerialization.a
-- Installing: /usr/local/lib/libclangFrontend.a
-- Installing: /usr/local/lib/libclangRewriteFrontend.a
-- Installing: /usr/local/lib/libclangFrontendTool.a
-- Installing: /usr/local/lib/libclangTooling.a
-- Installing: /usr/local/lib/libclangToolingCore.a
-- Installing: /usr/local/lib/libclangIndex.a
-- Installing: /usr/local/lib/libclangStaticAnalyzerCore.a
-- Installing: /usr/local/lib/libclangStaticAnalyzerCheckers.a
-- Installing: /usr/local/lib/libclangStaticAnalyzerFrontend.a
-- Installing: /usr/local/lib/libclangFormat.a
-- Installing: /usr/local/bin/clang-3.6
-- Installing: /usr/local/bin/clang
Creating clang++ executable based on clang
Creating clang-cl executable based on clang

```

```
-- Installing: /usr/local/bin/clang-format
-- Installing: /usr/local/share/clang/clang-format-bbedit.applescript
-- Installing: /usr/local/share/clang/clang-format-diff.py
-- Installing: /usr/local/share/clang/clang-format-sublime.py
-- Installing: /usr/local/share/clang/clang-format.el
-- Installing: /usr/local/share/clang/clang-format.py
-- Installing: /usr/local/bin/git-clang-format
-- Installing: /usr/local/lib/libclang.so.3.6
-- Installing: /usr/local/lib/libclang.so
-- Installing: /usr/local/bin/clang-check
-- Installing: /usr/local/share/llvm/cmake/LLVMExports.cmake
-- Installing: /usr/local/share/llvm/cmake/LLVMExports-noconfig.cmake
-- Installing: /usr/local/share/llvm/cmake/LLVMConfig.cmake
-- Installing: /usr/local/share/llvm/cmake/LLVMConfigVersion.cmake
-- Installing: /usr/local/share/llvm/cmake/LLVM-Config.cmake
-- Up-to-date: /usr/local/share/llvm/cmake/.
-- Installing: /usr/local/share/llvm/cmake/.AddLLVM.cmake
-- Installing: /usr/local/share/llvm/cmake/.AddLLVMDefinitions.cmake
-- Installing: /usr/local/share/llvm/cmake/.AddOCaml.cmake
-- Installing: /usr/local/share/llvm/cmake/.AddSphinxTarget.cmake
-- Installing: /usr/local/share/llvm/cmake/.ChooseMSVCCRT.cmake
-- Installing: /usr/local/share/llvm/cmake/.CrossCompile.cmake
-- Installing: /usr/local/share/llvm/cmake/.FindOCaml.cmake
-- Installing: /usr/local/share/llvm/cmake/.FindSphinx.cmake
-- Installing: /usr/local/share/llvm/cmake/.GetSVN.cmake
-- Installing: /usr/local/share/llvm/cmake/.HandleLLVMOptions.cmake
-- Installing: /usr/local/share/llvm/cmake/.HandleLLVMStdlib.cmake
-- Installing: /usr/local/share/llvm/cmake/.LLVMParseArguments.cmake
-- Installing: /usr/local/share/llvm/cmake/.LLVMProcessSources.cmake
-- Installing: /usr/local/share/llvm/cmake/.TableGen.cmake
```

参考 URL

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ソフトウェア著作権侵害、不正行為、および悪意のあるリバースエンジニアリングと戦うための理論、テクニック、ツール

過去 10 年間、ソフトウェア著作権侵害や改ざんに抵抗する技術の開発が大幅に進歩しました。これらの技術は、重要な知的財産を保護しようとするソフトウェア開発者にとって不可欠です。

Surreptitious Software は、これらのアプローチを理解したいと考える研究者、開発者、および学生のための最初の信頼できる包括的なリソースであり、彼らが提供するセキュリティのレベル、およびパフォーマンス・ペナルティが発生します。Christian Collberg と Jasvir Nagra は、暗号学、ステガノグラフィー、透かし入れ、ソフトウェアメトリクス、リバースエンジニアリング、コンパイラ最適化など、コンピュータサイエンスの関連分野の技術を集めています。包括的なサンプルコードを使用して、コードの難読化やソフトウェアフィンガープリンティングから改ざん防止や生まれつきのマーク付けに至るまで、保護スキームを実装する方法を紹介し、これらの技術の理論的および実践的な限界について説明します。カバレッジには次のものが含まれます リバースエンジニアリング、およびコンパイラの最適化が含まれます。包括的なサンプルコードを使用して、コードの難読化やソフトウェアフィンガープリンティングから改ざん防止や生まれつきのマーク付けに至るまで、保護スキームを実装する方法を紹介し、これらの技術の理論的および実践的な限界について説明します。カバレッジには次のものが含まれます リバースエンジニアリング、およびコンパイラの最適化が含まれます。包括的なサンプルコードを使用して、コードの難読化やソフトウェアフィンガープリンティングから改ざん防止や生まれつきのマーク付けに至るまで、保護スキームを実装する方法を紹介し、これらの技術の理論的および実践的な限界について説明します。

Obfuscator-LLVM [元論文](#)

Obfuscator-LLVM [発表スライド](#)

Obfuscator-LLVM [github](#)

[Obfuscating Android Applications using O-LLVM and the NDK](#)

Android の ネイティブアプリに Obfuscator-LLVM をかけた事例報告。OSX 用、Linux 用にコンパイルされた Obfuscator-LLVM が公開されている

[Deobfuscation: recovering an OLLVM-protected program](#)

Obfuscaor-LLVM の出力を Miasm で reverse engineering を試みた結果の報告。

[llvm obfuscator passes doesnt work with opt](#) Stack Overflow での Q&A.