

# LLVM Advisor

## A Unified Visualization Tool for Compiler Artifacts

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# Context

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- LLVM reports valuable compilation data
  - Optimization remarks
  - Profiling data
  - Timing data



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- LLVM reports valuable compilation data
  - Optimization remarks
  - Profiling data
  - Timing data
- However...
  - Multiple compilation flags
  - Different output data formats
  - Finding remarks in specific regions



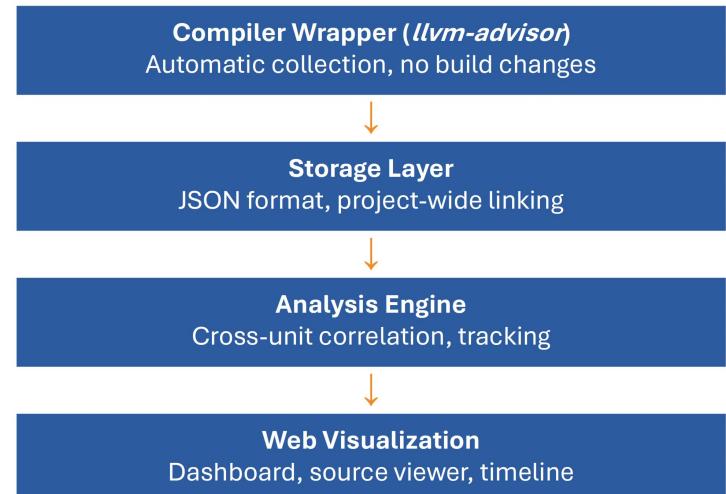
```
remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
alloca ('%15') without debug info with static size of 4 bytes
[-Rpass=kernel-info]
test.c:9:5: remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
direct call, callee is '@llvm.lifetime.start.p0' [-Rpass=kernel-info]
9 |     #pragma omp target teams distribute parallel for map(to: a, b) m
...
|
test.c:9:5: remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
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test.c:9:5: remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
'direct' instruction (%25') accesses memory in flat address space
[-Rpass=kernel-info]
test.c:9:5: remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
'direct call, callee is '@__kmpc_for_static_init_4'
[-Rpass=kernel-info]
test.c:11:16: remark: in artificial function
'__omp_offloading_803_29744d_main_l9_omp_outlined_omp_outlined',
"/home/cc/Files/llvm/bin/clang-offload-packager" "-o" "/tmp/test-f38eb3.out" ice
" --image-file="/tmp/test-sm-75-7a20ba.o, triple=nvptx64-nvidia-cuda, arch=sm_
75, kind=openmp, feature+=ptx85"
"/home/cc/Files/llvm/bin/clang-21" "-cc1" "-triple" "x86_64-unknown-linux-g
nu" "-O2" "-emit-obj" "-dumpdir" "a-" "-disable-free" "-clear-ast-before-bac
kend" "-disable-llvm-verifier" "-discard-value-names" "-main-file-name" "tes
t.c" "-mrelocation-model" "pic" "-pic-level" "2" "-pic-is-pie" "-mframe-poin
ter-none" "-fmath-errno" "-ffp-contract=on" "-fno-rounding-math" "-mconstruc
tor-aliases" "-funwind-tables=2" "-target-cpu" "x86-64" "-tune-cpu" "generic"
"-debug-info-kind=constructor" "-dwarf-version=5" "-debugger-tuning=gdb" "
-fdebug-compilation-dir=/home/cc/testing" "-fcovariance-compilation-dir=/home/
cc/testing" "-resource-dir" "/home/cc/Files/llvm/lib/clang/21" "-fmessage-lengt
h" "19" "-fopenmp" "-fopenmp-new" "-fopenmpabi-version=4.2.1" "-fskip-odr-
check-in-gmf" "-fcolor-diagnostics" "-vectorize-loops" "-vectorize-slp" "-fe
mbed-offload-object=/tmp/test-f38eb3.out" "--offload-targets=nvptx64-nvidia-
cuda" "-faddrssig" "-D__GCC_HAVE_DWARF2_CFI_ASM=1" "-o" "/tmp/test-835b01.o"
"-x" "ir" "/tmp/test-8a78b4.bc"
```

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# Solution: LLVM Advisor

# LLVM Advisor

- **LLVM Advisor** provides a **unified infrastructure**
  - **Gather** and **organize** compilation data
  - **Analyze** and correlate data
  - **Visualize** on a modern web interface



# LLVM Advisor

- Compile with data collection

```
$ llvm-advisor clang -O2 -g main.c -o main
```

```
$ tree -a .llvm-advisor
.llvm-advisor/
└── main/
    └── main_20250825_143022/ # Timestamped compilation session
        ├── ir/main.ll         # LLVM IR output
        ├── assembly/main.s     # Assembly output
        ├── ast/main.ast        # AST dump
        ├── diagnostics/        # Compiler warnings/errors
        └── ...                  # Additional analysis data
```

# LLVM Advisor

LLVM Advisor  
Compilation Analysis Dashboard

Unit: test (24 artifacts) - 8/21/2023 Connected

Dashboard   Explorer   Performance

Total Files 1

Success Rate 95.5%

Total Errors 3

Compilation Phases 0

### Remarks Distribution

asm-printer  
prologue/epilogue  
sdagisel  
atomic-expand  
inline

### Diagnostic Levels

Level	Count
Error	~45
Warning	~45
Note	~85
Info	~10

### Compilation Information

Metric	Value
Total Execution Time	0.0209s
Timing Phases	4
Top Time Consumer	Front end
Clang Version	22.0.0git
Target Architecture	x86_64-unknown-linux-gnu
Thread Model	posix

### Binary Size Breakdown

Generated from object file (1.4 MB 99.6%)

Generated from object file (309 /tmp/llvm-advisor-758438/workfile.size.o.text)

Generated from object file (D1 /tmp/llvm-advisor-758438/main\_size.o.text)

Generated from object file (1111 /tmp/llvm-advisor-4a05b9/test\_size.o.data)

### Optimization Remarks Summary

Total Optimization Remarks  
Total number of optimization opportunities found

### Top Optimization Passes

Asm Printer  
BasicBlock: LEA64r: ADD64ri32: MOV64mr: CALL64pcrel32: MOV32mi: MOV32mr: ...

LLVM Advisor  
Compilation Analysis Dashboard

Unit: test (24 artifacts) - 8/21/2023 Connected

Dashboard   Explorer   Performance

### Performance Analysis

Visualization: Time Order   Refresh Data   Search: total   0 results

#### Compilation Time Trace

Events: 591 events • Zoom: 195%   Reset 195%

Legend: Optimizer, MemDepPass, AMManager, RunAA, LoopAnalysis, TargetAnalysis

Timeline markers: 1.5ms, -10ms, -0.5ms, 0.0ms, 0.5ms, 1.0ms, 1.5ms, 2.0ms, 2.5ms, 3.0ms, 3.5ms, 4.0ms, 4.5ms, 5.0ms, 5.5ms, 6.0ms

#### Runtime Offloading Trace

Events: 1 Keys   Reset 146%

Legend: Runtime target task, DevTask

Timeline markers: 0.0ms, 50.0ms, 100.0ms, 150.0ms, 200.0ms, 250.0ms, 300.0ms, 350.0ms, 400.0ms, 450.0ms, 500.0ms

# LLVM Advisor

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LLVM Advisor  
Compilation Analysis Dashboard

Unit: main\_1218 (43 artifacts) • Connected

Dashboard   Explorer   Performance

### Compilation Information

Total Execution Time	0.0235s
Timing Phases	4
Top Time Consumer	Front end
Clang Version	22.0.0git
Target Architecture	x86_64-unknown-linux-gnu
Thread Model	posix

### Binary Size Breakdown

A pie chart illustrating the distribution of binary size across various components. The largest segment is 'Generated from object file' at approximately 50%. Other segments include '1111 /tmp/llvm-advisor-4a05b9/test\_size.o.text' (309), 'D1 /tmp/llvm-advisor-758438/main\_size.o.text' (309), and '1111 /tmp/llvm-advisor-4a05b9/test\_size.o.data' (309).

### Optimization Remarks Summary

Total Optimization Remarks	162
Unique Optimization Passes	5
Functions with Remarks	22

### Top Optimization Passes

Asm Printer	BasicBlock: MOV64mr: LEA64r: MOV32mi: MOV64mi32: CALL64pcrel32: MOV64rm: ... 125 remarks   22 functions
PrologueEpilog	stack bytes in function " 22 remarks   22 functions
Sdagisel	FastSel missed 11 remarks   6 functions
Atomic Expand	A compare and swap loop was generated for an atomic fadd operation at system mem... 3 remarks   3 functions

- Who can benefit?

- Advanced developers
- Newcomers in LLVM
- Educators



# Questions?

Visit the **poster session** tomorrow!

Try **LLVM Advisor**



<https://llvm-advisor.onrender.com/>

**LLVM PR #147451**

<https://github.com/llvm/llvm-project/pull/147451>



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