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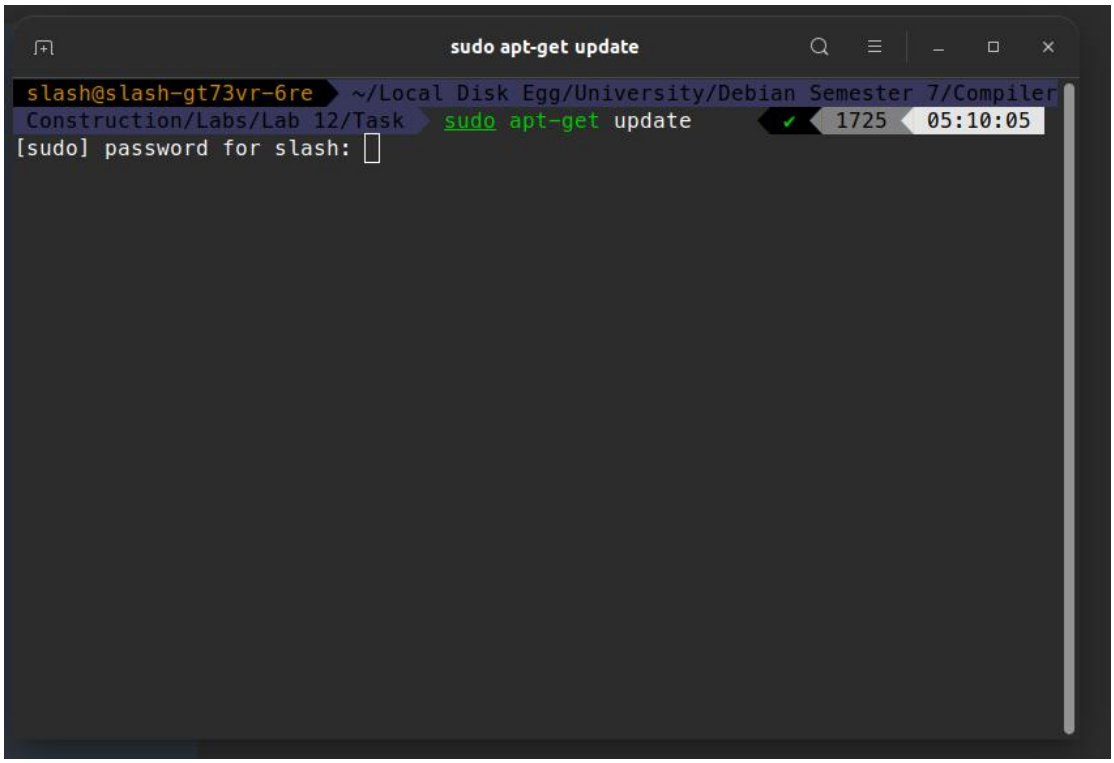
**Class: BSCS-8-A**
**CMS: 242554**

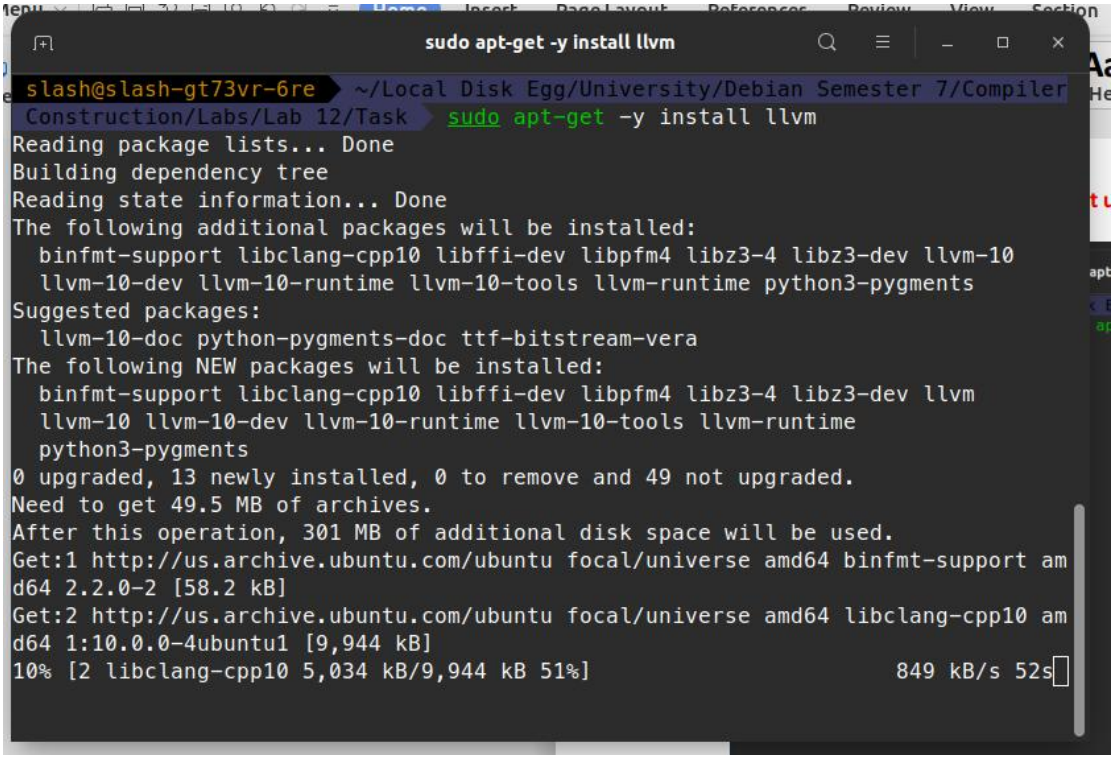
# Compiler Construction Lab 12

## Task 1 ( Install LLVM ):

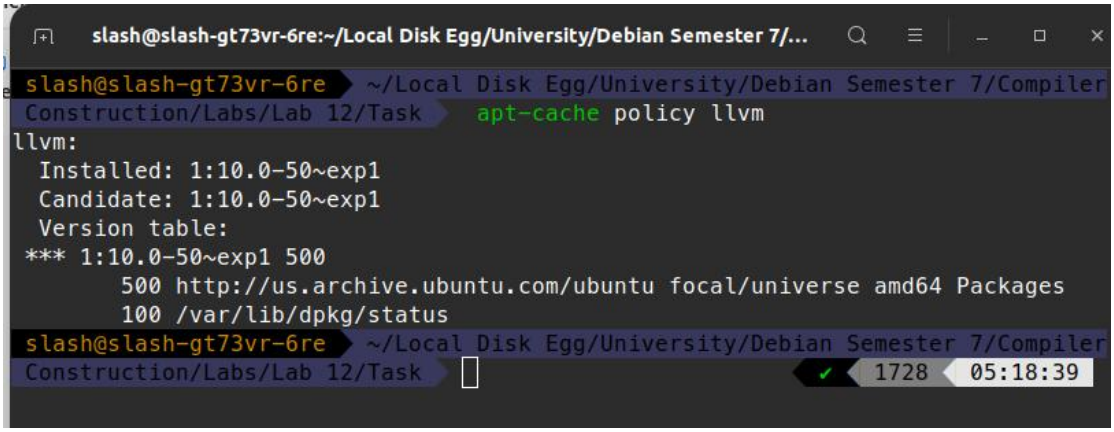
- **Installing LLVM using apt-get, first update apt-get.**




- **Installing LLVM with command " *sudo apt-get -y install llvm* '**

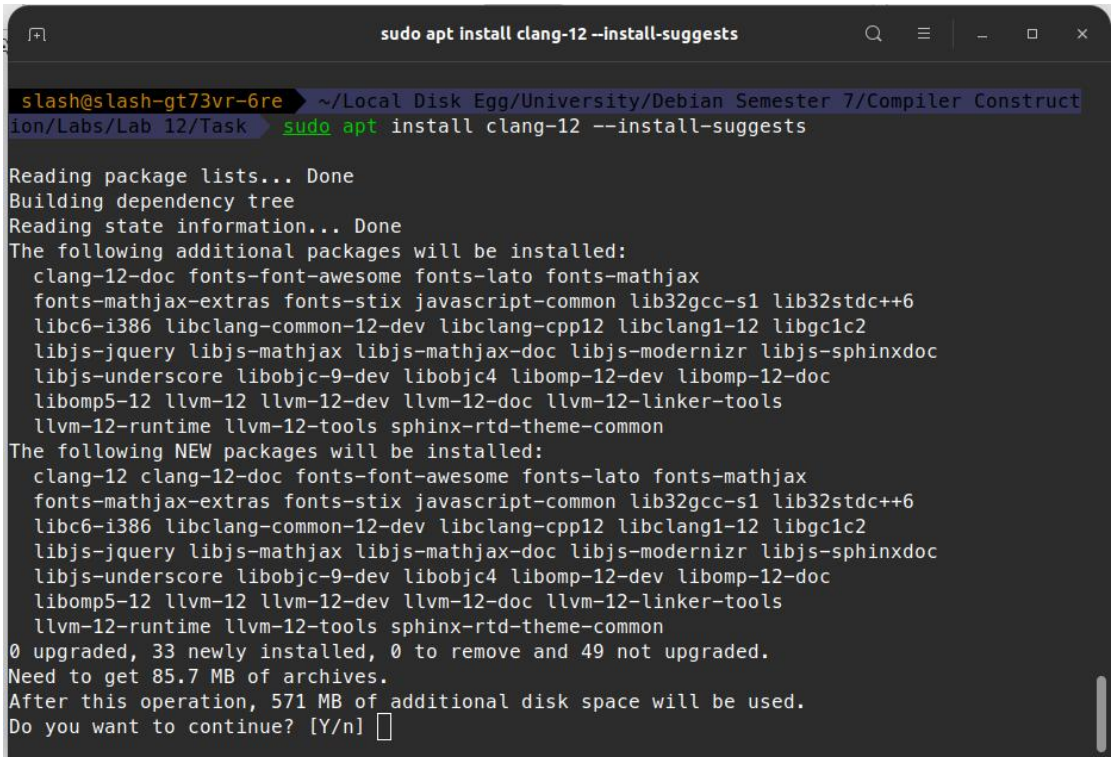



- **Checking if installed by " apt-cache policy llvm '**

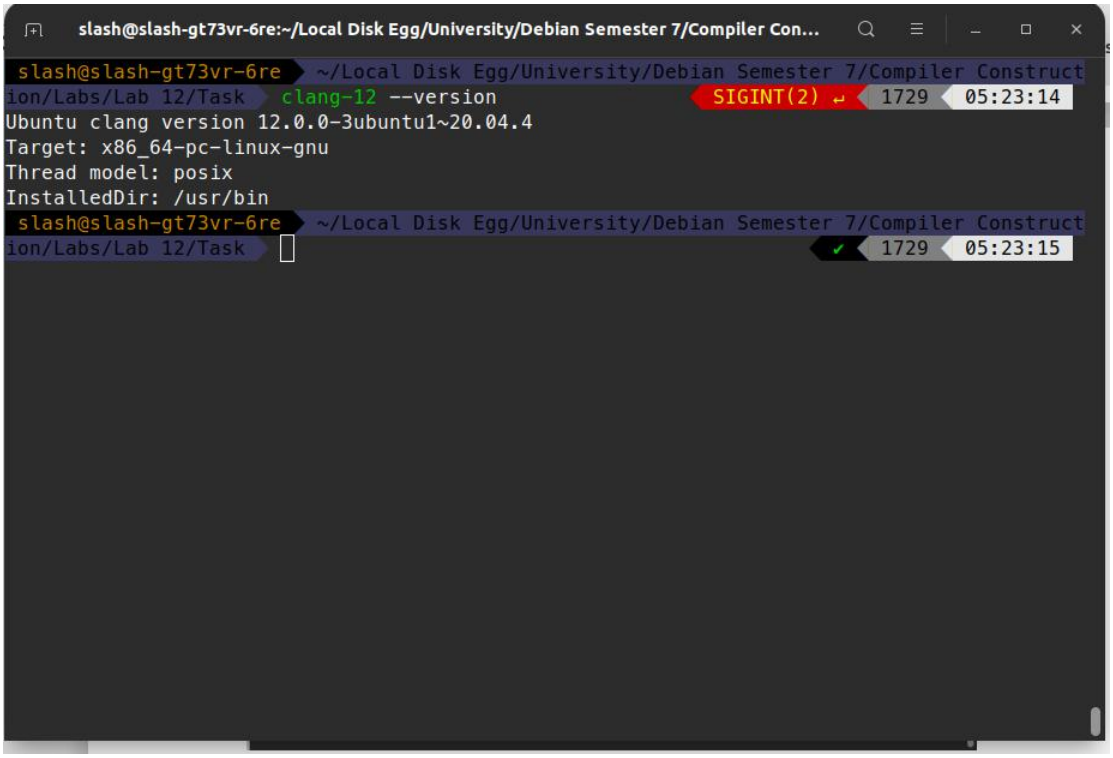



**NOTE: NO NEED TO CONFIGURE AND COMPILE AS APT-INSTALLED**

- **Installing clang12 as not exists:**




- **Check if installed:**

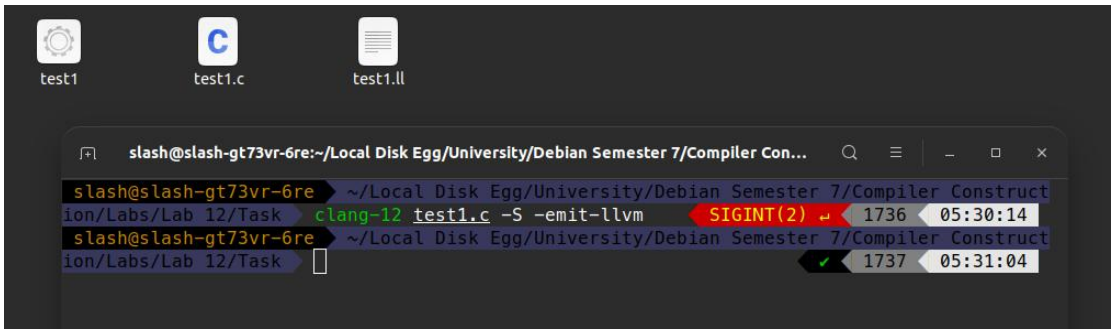



## Task 2 ( LLVM Code ):

- **Created " *task1.c* " with code given:**


- **Compiling using clang (native code) and running it:**


- **Generate LLVM IR (Assembly Form) using following command:**



Open — test1.ll — ~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 12/Task — Save

```
; ModuleID = 'test1.c'
source_filename = "test1.c"
target datalayout = "e-m:e-p270:32:32-p271:32:32-p272:64:64-i64:64-f80:128-n8:16:32:64-S128"
target triple = "x86_64-pc-linux-gnu"

@.str = private unnamed_addr constant [22 x i8] c"Hi, my LLVM + CLANG!\0A\00", align 1

; Function Attrs: noinline nounwind optnone uwtable
define dso_local i32 @main() #0 {
  %1 = call i32 (i8*, ...) @printf(i8* getelementptr inbounds ([22 x i8], [22 x i8]* @.str, i64 0, i64 0))
  ret i32 0
}

declare dso_local i32 @printf(i8*, ...) #1

attributes #0 = { noinline nounwind optnone uwtable "disable-tail-calls"="false" "frame-pointer"="all" "less-precise-fpmad"="false" "min-legal-vector-width"="0" "no-infs-fp-math"="false" "no-jump-tables"="false" "no-nans-fp-math"="false" "no-signed-zeros-fp-math"="false" "no-trapping-math"="true" "stack-protector-buffer-size"="8" "target-cpu"="x86-64" "target-features"="+cx8,+fxsr,+mmx,+sse,+sse2,+x87" "tune-cpu"="generic" "unsafe-fp-math"="false" "use-soft-float"="false" }
attributes #1 = { "disable-tail-calls"="false" "frame-pointer"="all" "less-precise-fpmad"="false" "no-infs-fp-math"="false" "no-nans-fp-math"="false" "no-signed-zeros-fp-math"="false" "no-trapping-math"="true" "stack-protector-buffer-size"="8" "target-cpu"="x86-64" "target-features"="+cx8,+fxsr,+mmx,+sse,+sse2,+x87" "tune-cpu"="generic" "unsafe-fp-math"="false" "use-soft-float"="false" }

!llvm.module.flags = !{!0}
!llvm.ident = !{!1}

!0 = !{i32 1, !"wchar_size", i32 4}
!1 = !{!"Ubuntu clang version 12.0.0-3ubuntu1~20.04.4"}
```

LLVM IR — Tab Width: 8 — Ln 14, Col 43 — INS

- **Running same command with optimization flag:**

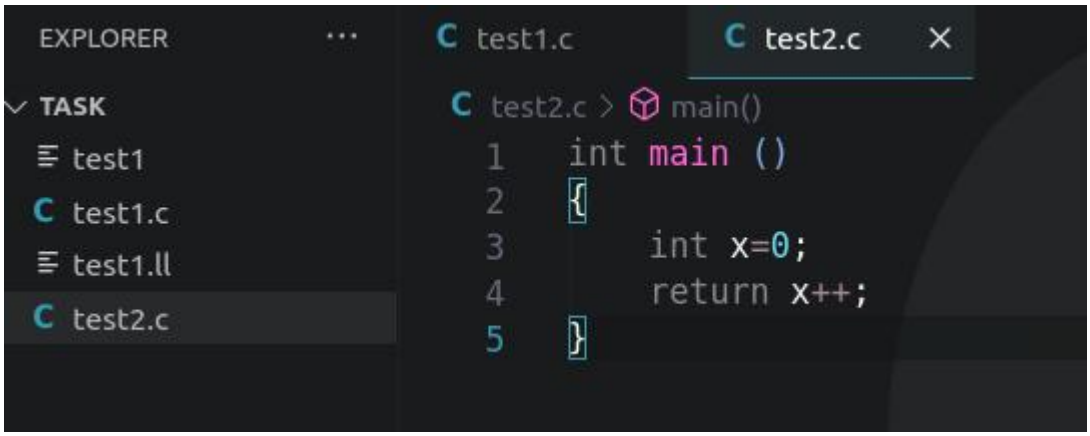

Open — test1.ll — ~/Local Disk Egg/University/Debian Semester 7/Compiler Construction/Labs/Lab 12/Task — Save

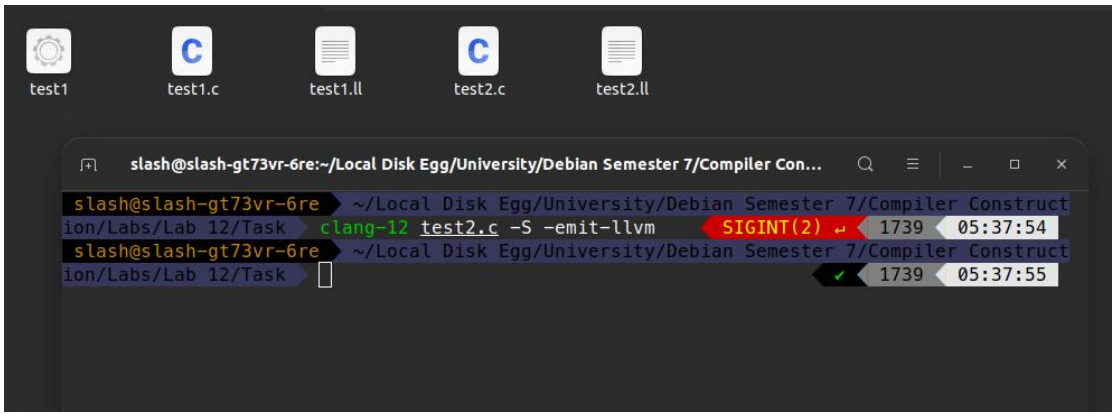
```
; ModuleID = 'test1.c'
source_filename = "test1.c"
target datalayout = "e-m:e-p270:32:32-p271:32:32-p272:64:64-i64:64-f80:128-n8:16:32:64-S128"
target triple = "x86_64-pc-linux-gnu"

@str = private unnamed_addr constant [21 x i8] c"Hi, my LLVM + CLANG!\00", align 1

; Function Attrs: nofree nounwind uwtable
define dso_local i32 @main() local_unnamed_addr #0 {
  %1 = tail call i32 @puts(i8* nonnull dereferenceable(1) getelementptr inbounds ([21 x i8], [21 x i8]* @str, i64 0, i64 0))
  ret i32 0
}

; Function Attrs: nofree nounwind
declare noundef i32 @puts(i8* nocapture noundef readonly) local_unnamed_addr #1

attributes #0 = { nofree nounwind uwtable "disable-tail-calls"="false" "frame-pointer"="none" "less-precise-fpmad"="false" "min-legal-vector-width"="0" "no-infs-fp-math"="false" "no-jump-tables"="false" "no-nans-fp-math"="false" "no-signed-zeros-fp-math"="false" "no-trapping-math"="true" "stack-protector-buffer-size"="8" "target-cpu"="x86-64" "target-features"="+cx8,+fxsr,+mmx,+sse,+sse2,+x87" "tune-cpu"="generic" "unsafe-fp-math"="false" "use-soft-float"="false" }
attributes #1 = { nofree nounwind }

!llvm.module.flags = !{!0}
!llvm.ident = !{!1}

!0 = !{i32 1, !"wchar_size", i32 4}
!1 = !{!"Ubuntu clang version 12.0.0-3ubuntu1~20.04.4"}
```

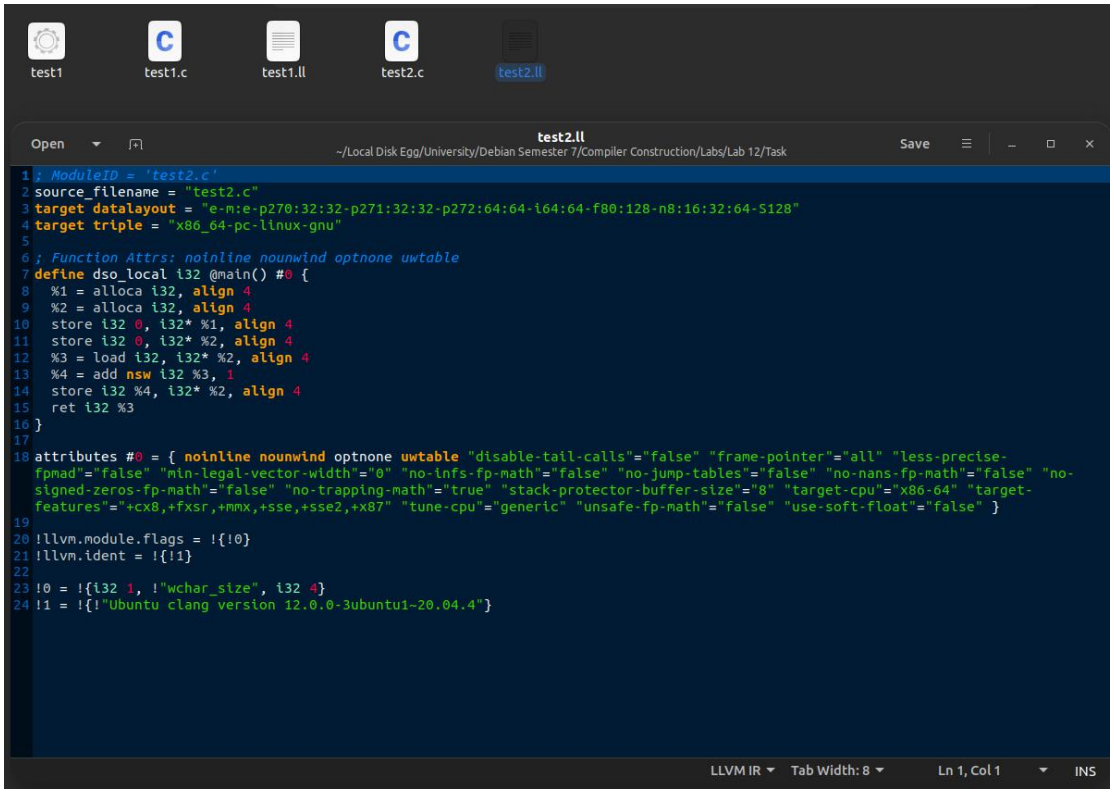
LLVM IR — Tab Width: 8 — Ln 14, Col 20 — INS

**Difference : Optimized code have some other functions used like “Puts” in place of “print” , etc. In DSOLOCAL**

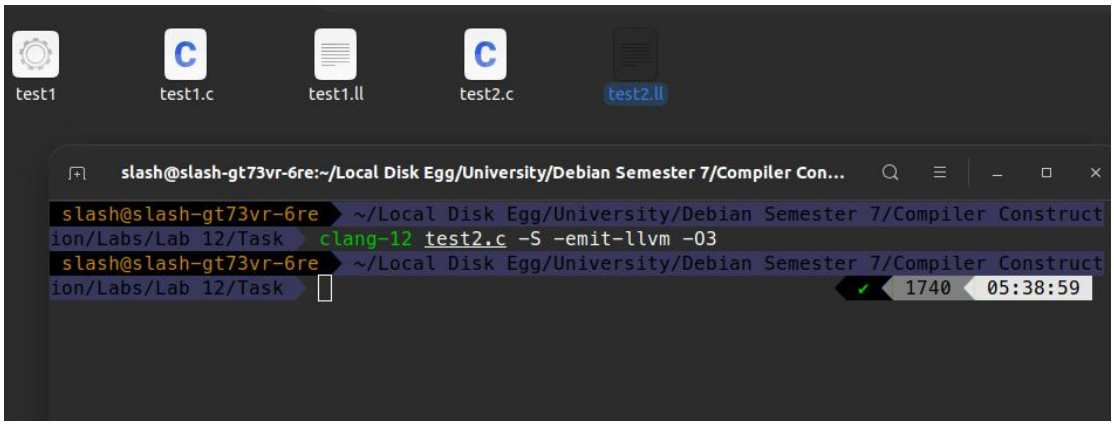
- **Doint the same for another code:**

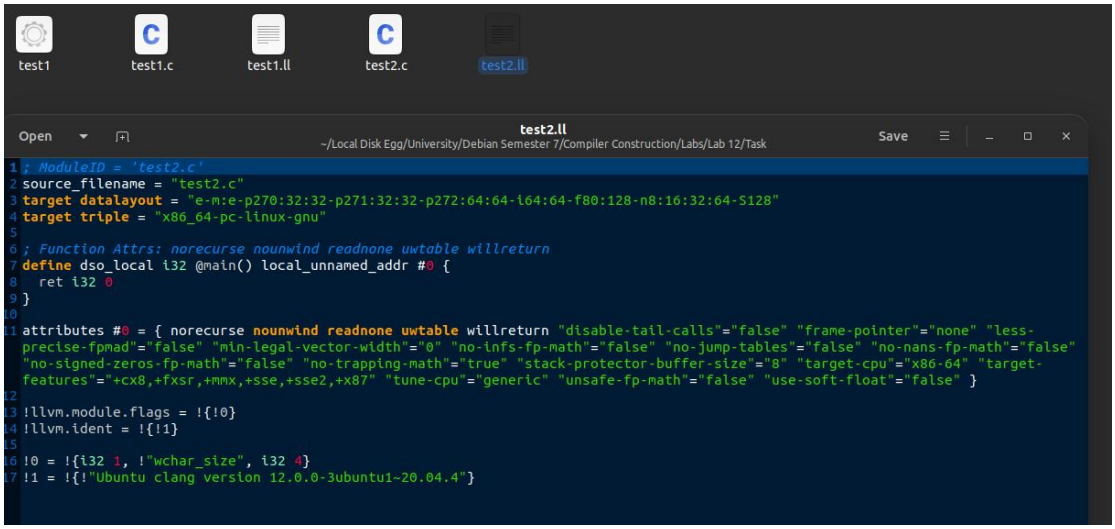





## AND NOW OPTIMIZED :



**Difference : As noticed here, Optimized Code has only one line in dso_local whereas there's many in non-optimized Code**