

GCC and operating systems

- a compiler and operating systems are often co-dependant
- during this weeks lecture we have examined the implementation of `SYSTEM_TRANSFER` in GNU LuK
- copy the following code into the C file suggested

GCC and operating systems



testgcc.c

```
void interruptsOn (void)
{
    asm volatile ("sti");
}

void interruptsOff (void)
{
    asm volatile ("cli");
}

unsigned int getFlags (void)
{
    unsigned int b;

    asm volatile("pushf ; popl %%ebx ; movl %%ebx, %[b]" : [b] "=rm" (b) ::: "ebx");
    return b;
}
```

GCC and operating systems



testgcc.c

```
typedef void *PROCESS;  
  
int turnInterrupts (int oo)  
{  
    unsigned int flags = getFlags();  
    if (oo)  
        interruptsOn ();  
    else  
        interruptsOff ();  
  
    return (flags & (1 << 9)) != 0;  
}
```

GCC and operating systems

testgcc.c

```
void SYSTEM_TRANSFER (PROCESS *p1, PROCESS p2)
{
    int toOldState;

    toOldState = turnInterrupts (0);
    asm volatile ("pusha ; pushf"); /* push all registers */
    /* remember p1 is **void */
    asm volatile ("movl %[p1], %%eax ; movl %%esp, (%%eax)"
        :: [p1] "rm" (p1)); /* p1 := top of stack */
    asm volatile ("movl %[p2], %%eax ; movl %%eax, %%esp"
        :: [p2] "rm" (p2)); /* top of stack := p2 */
    asm volatile ("popf ; popa"); /* restore all registers */
    toOldState = turnInterrupts (toOldState);
}
```

GCC and operating systems

- compile this program using

```
$ gcc -o testgcc-unoptimized.s -m32 -S testgcc.c
```

- produce an instruction by instruction commentary of the function
SYSTEM_TRANSFER
 - the output of the compiler is placed into testgcc-unoptimized.s

GCC and operating systems

- now recompile the program using:

```
$ gcc -O3 -o testgcc-optimized.s -m32 -S testgcc.c
```

- the output from the compiler is placed into `testgcc-optimized.s`
- produce an instruction by instruction commentary of the function `SYSTEM_TRANSFER`
 - which is easier to understand, the optimised or unoptimised assembly output?