

# **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?