Identify Instruction Se Architecture

Know a brief history of x86 processors

Understand the lifetime of a program

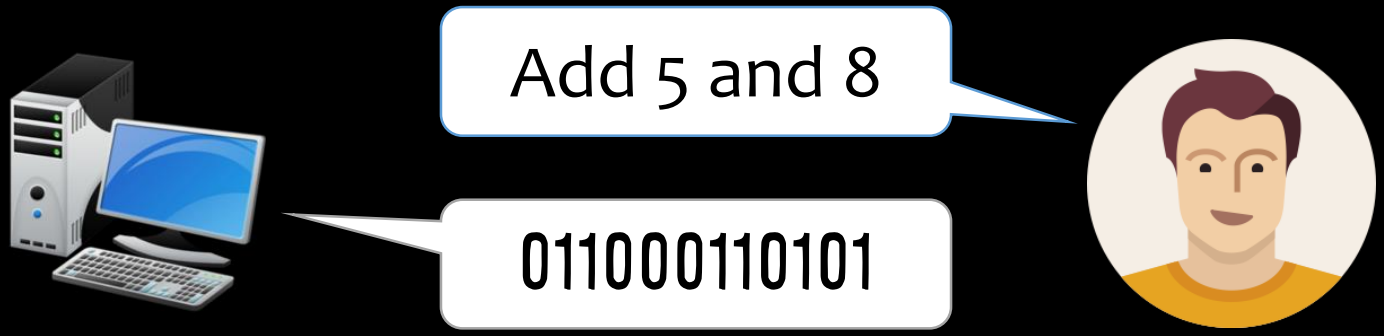
Name x86 integer registers

Machine Programming

① Instruction Set Architectures

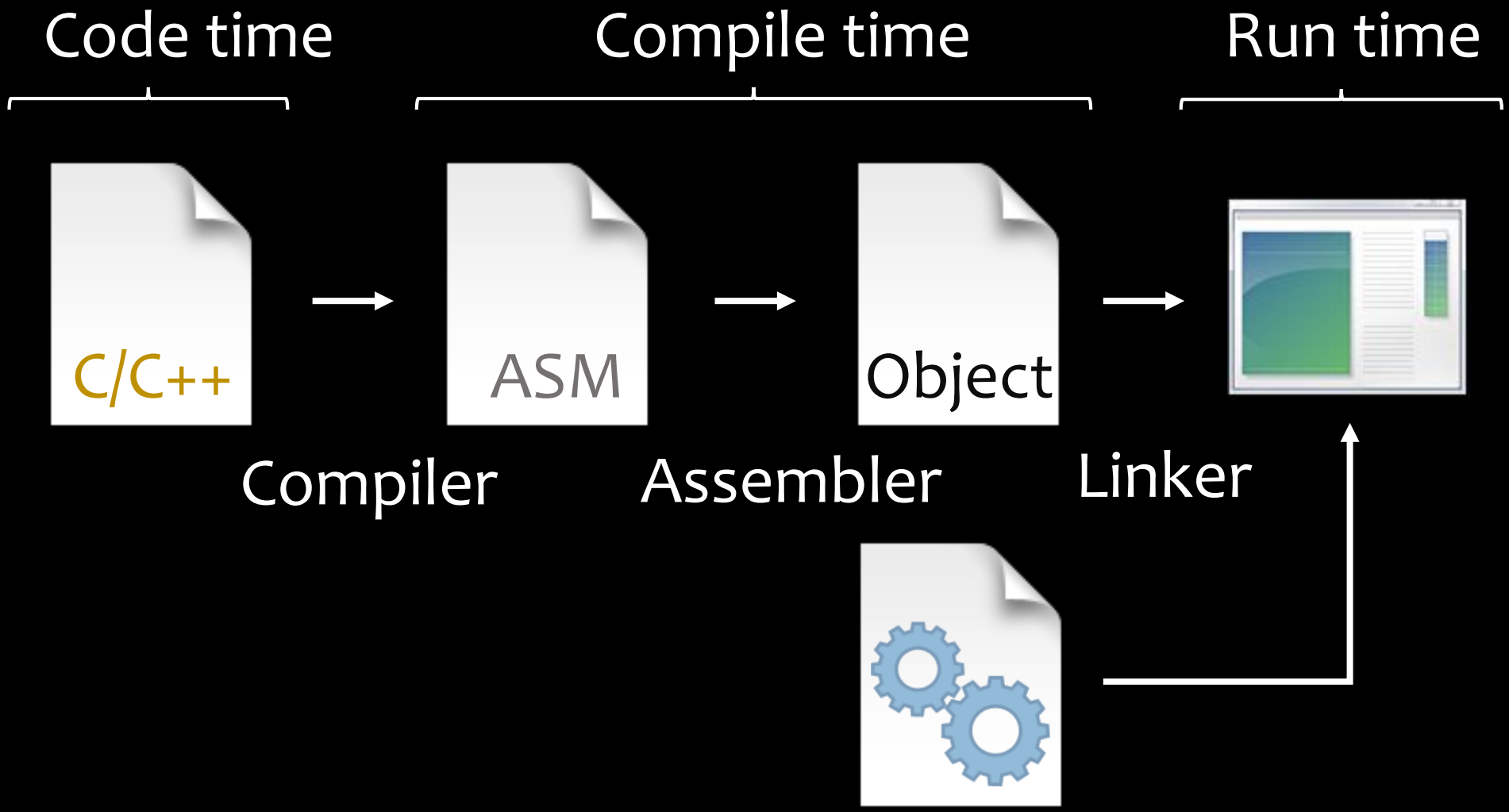
② Machine Programming

Machine vs. human language

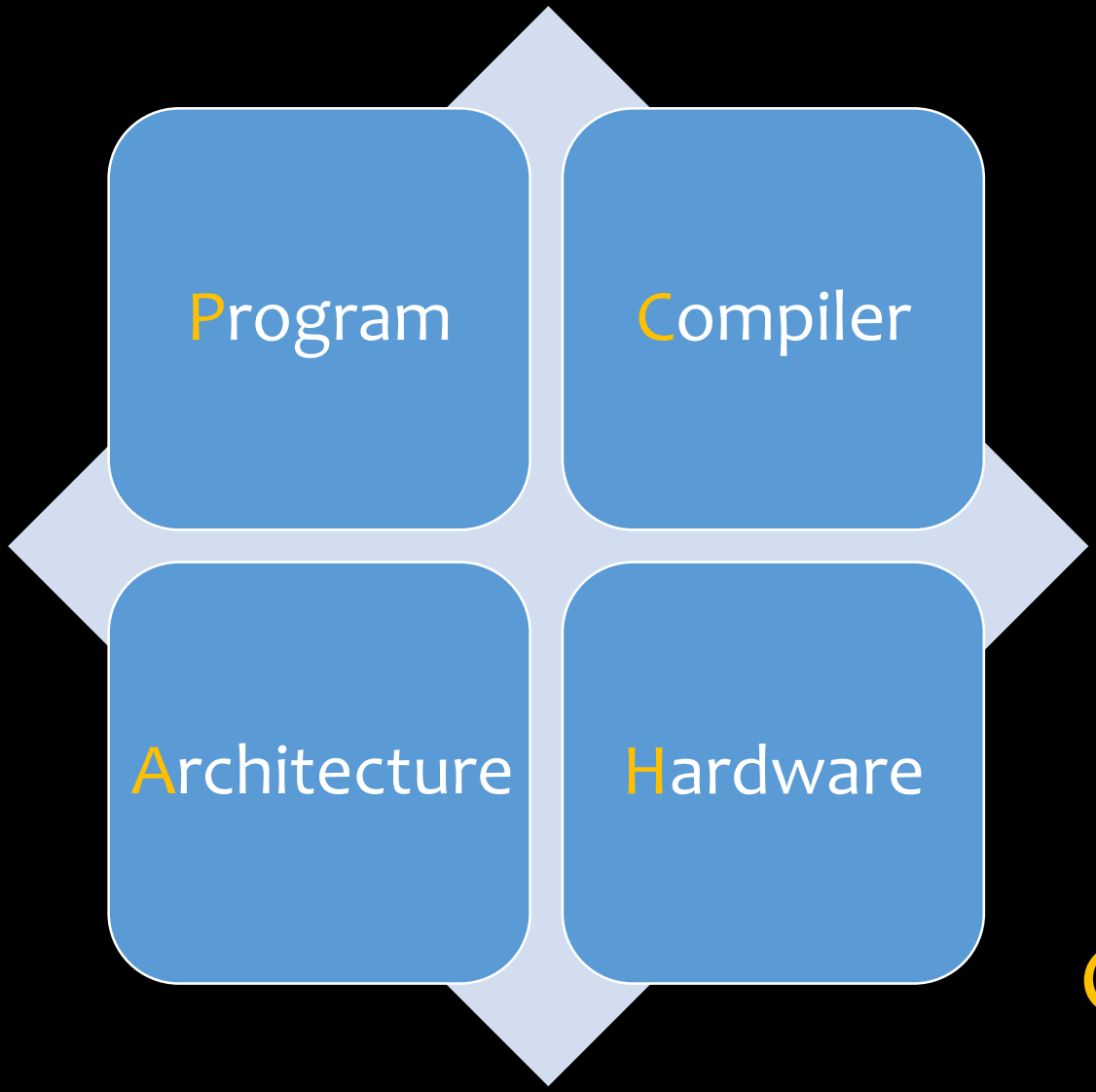


instructions	words
instruction set	vocabulary
machine language	assembly language
`03 45 08`	`add 0x8(%ebp),%eax`

Lifetime of Program



Program Performance



CHAP

Instruction
Set
Architecture

Instruction Set Architectures

29K

275K

230M

2.6B

1968 → 1978 → 1985 → 2005

Moore's law

Gordon Earle Moore

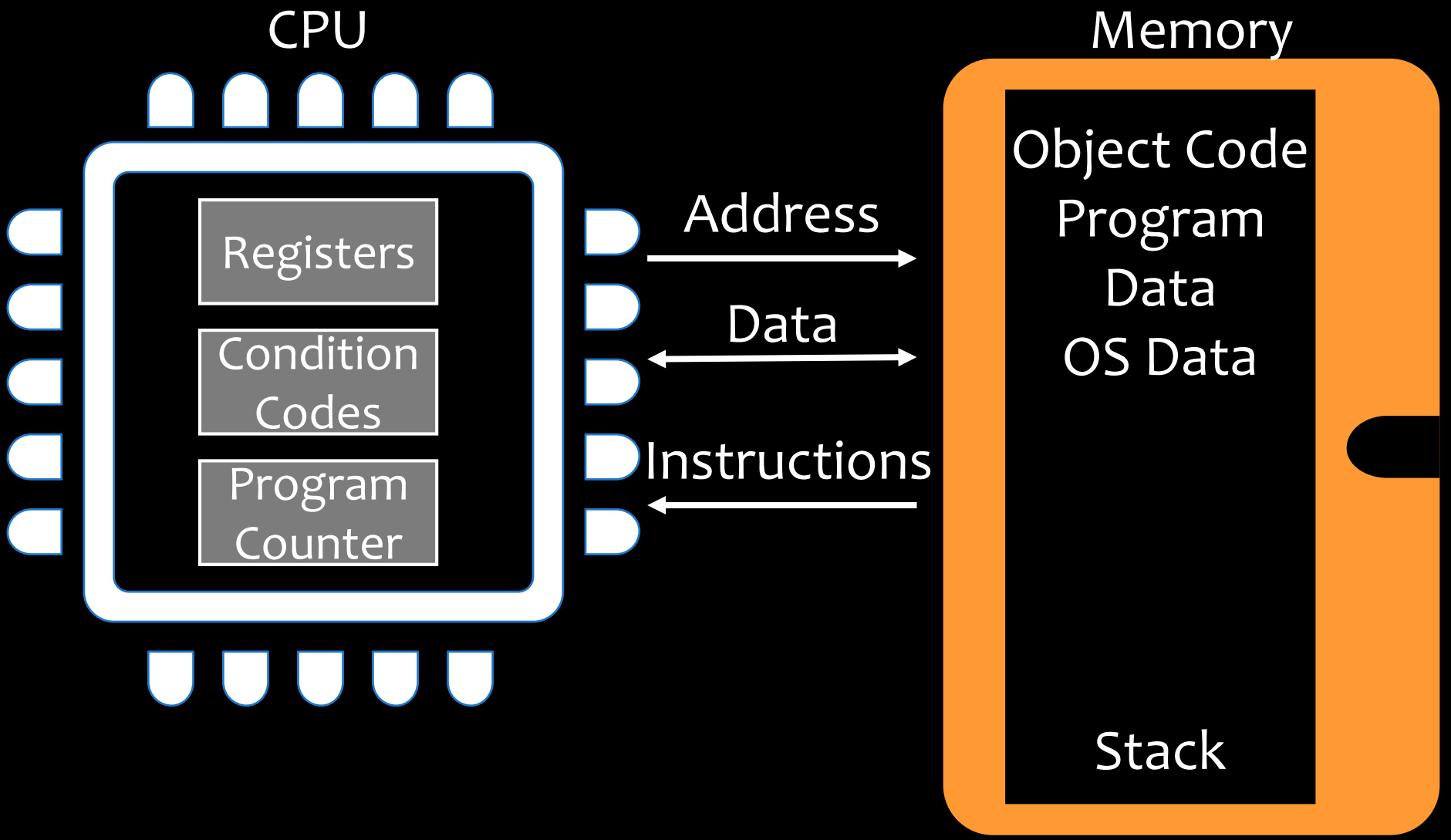
Co-founder of Intel Corporation

"The number of transistors in a chip will approximately double every two years."

Moore's law

Advanced Micro Devices

Assembly Programmer's View



Compiling

32-bit

```
int sum(int x, int y)
{
   int t = x+y;
   return t;
}
```

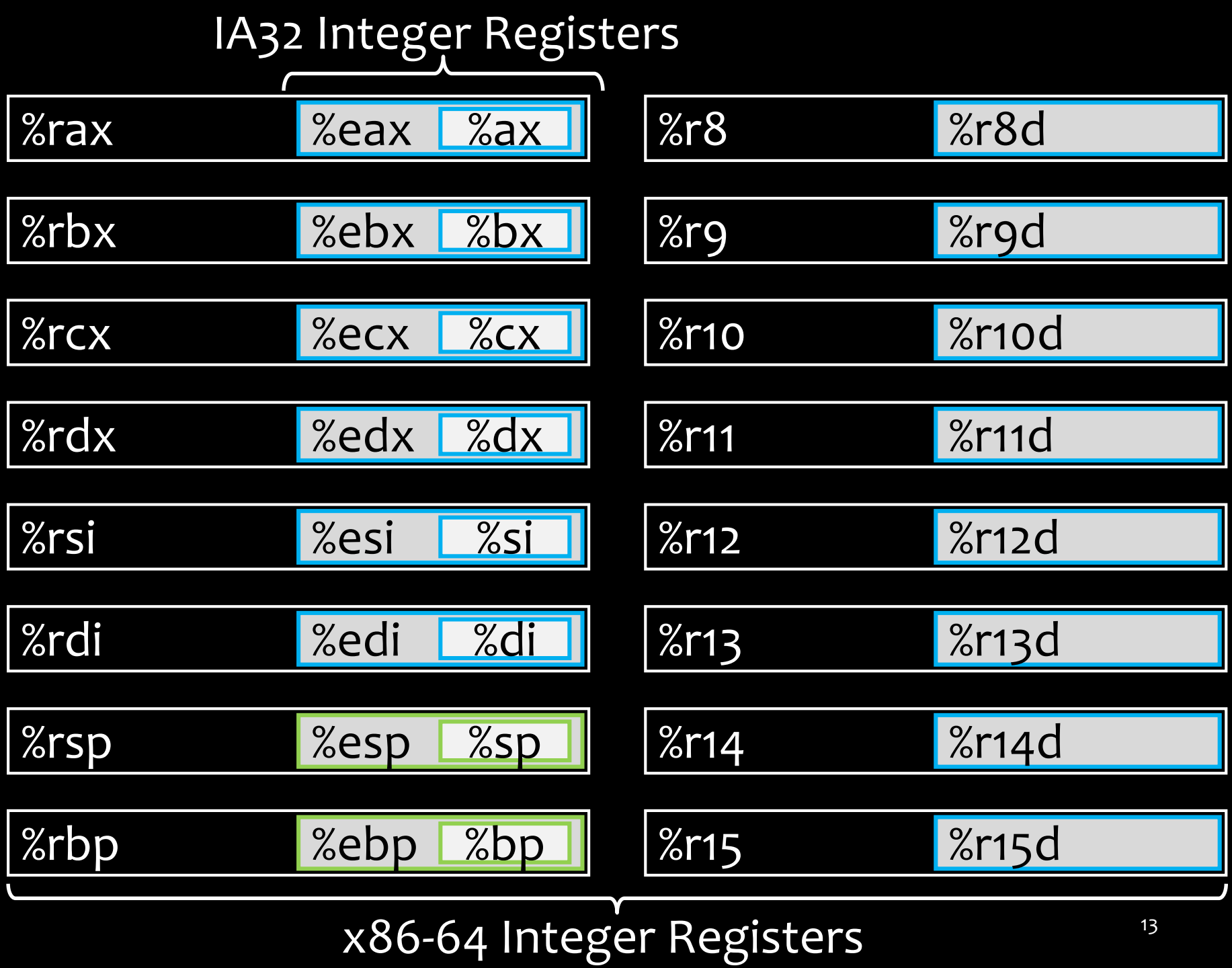
code.c

gcc –O1 –S code.c

```
sum:
push %ebp
mov %esp,%ebp
mov 12(%ebp),%eax
add 8(%ebp),%eax
mov %ebp,%esp
pop %ebp
ret
```

64-bit

```
sum:
leal (%rdi,%rsi),%eax
ret
```


IA32 Integer Registers
%rax
%eax
%ax
%rbx
%ebx
%bx
%rcx
%ecx
%cx
%rdx
%edx
%dx
%rsi
%esi
%si
%rdi
%edi
%di
%rsp
%esp
%sp
%rbp
%ebp
%bp
%r8
%r8d
%r9
%r9d
%r10
%r10d
%r11
%r11d
%r12
%r12d
%r13
%r13d
%r14
%r14d
%r15
%r15d
x86-64 Integer Registers

Summary

- Instruction Set Architecture
- Program Performance
- Intel x86 Architecture
- x86 Registers