

15-213

“The course that gives CMU its Zip!”

Machine-Level Programming II: Control Flow Sept. 09, 2008

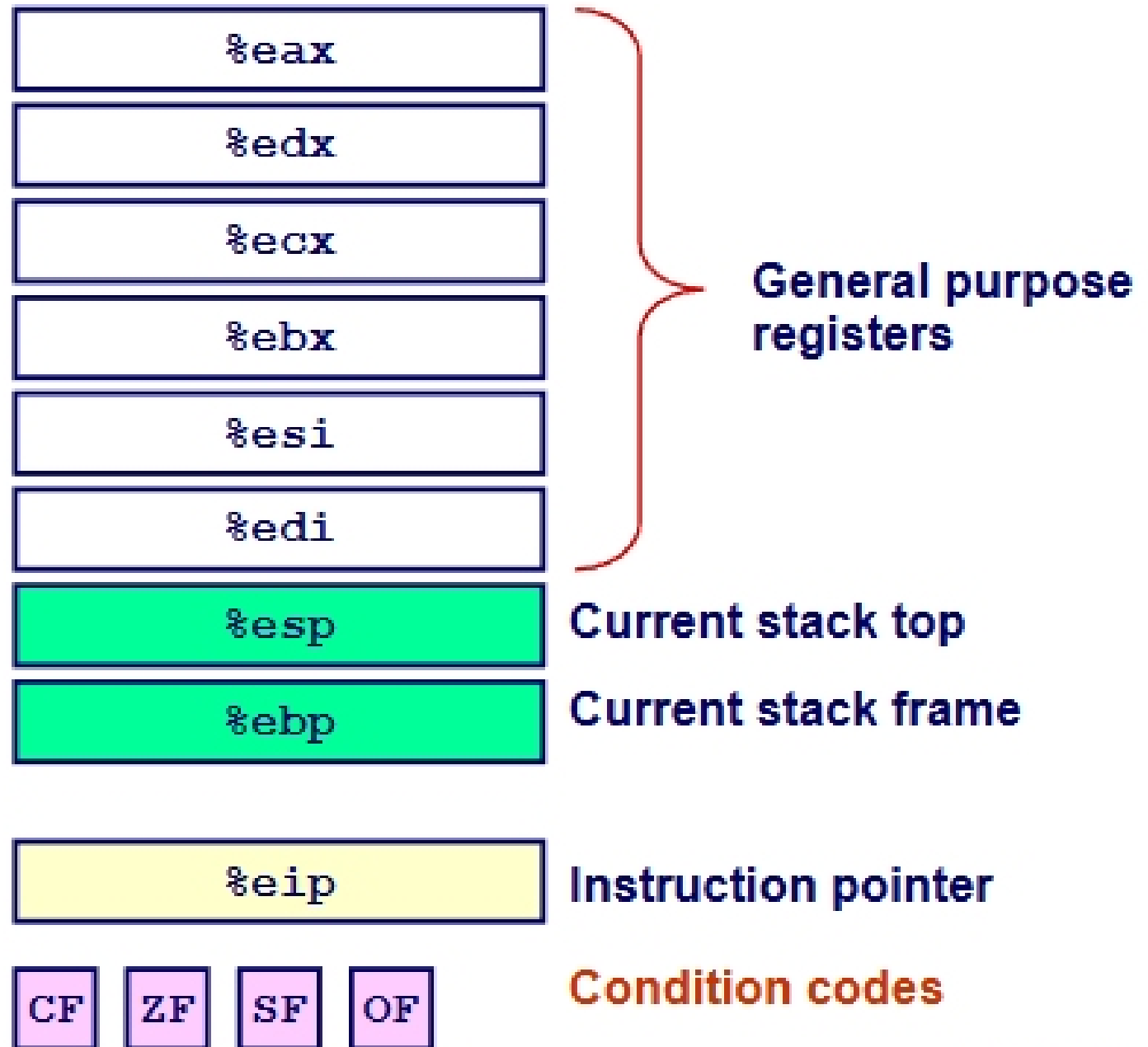
Topics

- Condition Codes
 - Setting
 - Testing
- Control Flow
 - If-then-else
 - Varieties of Loops
 - Switch Statements
- x86-64 features
 - conditional move
 - different loop implementation

Processor State (IA32, Partial)

Information about currently executing program

- Temporary data
- Location of current code control point
- Location of runtime stack
- Status of recent tests



Condition Codes

Single Bit Registers

CF Carry Flag

ZF Zero Flag

SF Sign Flag

OF Overflow Flag

Implicitly Set By Arithmetic Operations

`addl Src, Dest`

`addq Src, Dest`

C analog: $t = a + b$

($a = \text{Src}, b = \text{Dest}$)

- **CF** set if carry out from most significant bit

- Used to detect unsigned overflow

- **ZF** set if $t == 0$

- **SF** set if $t < 0$

- **OF** set if two's complement overflow

$(a > 0 \ \&\& \ b > 0 \ \&\& \ t < 0)$

$|| \ (a < 0 \ \&\& \ b < 0 \ \&\& \ t \geq 0)$

Not set by `lea`, `inc`, or `dec` instructions