CSE 3430

Class 7 and 8

**Slide set A-4**

Y86 Part A

What is Y86? (Y86-64 is 64 bits, but we will just say Y86)

Is the Y86 processor hardware? (That is, is it circuits, registers, including a PC and IR (as we saw before), ALU hardware, etc.?

What well-known and widely used processors in the real world is it based on?

**Assembly Language:** As we said before, it is a text-based form of machine language.

Each type of processor has an assembly language (sometimes, more than one)

We will learn an assembly language for Y86-64, a 64-bit processor based on Intel 64-bit X86-64

**What is an ISA (Instruction Set Architecture)?**

* This is the part of the processor that a programmer writer (or a compiler or assembler) can “interact with” (that is, control)
* It includes a) the instructions; b) registers; c) (main) memory access modes; d) exceptions (used for errors or other unusual circumstances)
* RISC and CISC: We saw these before. Real processors are one of the two types, but the Y86 processor is a “hybrid” (it has many RISC features, but some CISC features)

**Registers**

* How many data registers does it have?
* The number is unusual, because real processors always have a number equal to a power of 2 (1, 2, 4, 8, 16, 32, 64, etc.)
* The registers have names: rax, rbx, rcx, etc.: You do not need to learn all of the names, but certain registers have important uses, so we will need to learn the names of those.
* They are all 64-bit registers

**Also a PC and IR (all processors have these) but our program cannot access them directly (we can execute instructions that will affect them though).**

**Condition Codes (Flags)**: There are three of them, SF, ZF, OF

* No CF (Carry Flag) because only signed operations can be done!

**Memory**

* Up to 4 GB, but our system only has about 4 KB (That will be more than enough)
* We will learn addressing modes later.

**Exceptions/Errors**

* We do not need to worry about these!

**Limitations**

* Only signed operations (so no CF)
* Only 64-bit data
* ALU operations (there are only 4 of them) can only be performed on data in registers, but not in memory!

**Learning Y86**

Assembler Directives

Status Conditions: AOK, HALT, ADR, INS

Exceptions: Real systems report the error to the OS, and the process will be terminated. The Y86 processor just HALTs (Stops)

**GETTING THE SOFTWARE FOR THE Y86 SIMULATOR**

* Please see the instructions on slides 19-24 of slide set A-4 on Carmen.

PLEASE ALSO SEE THE SEPARATE DOCUMENT ON CARMEN IN THE Class slides > Part A folder on Carmen: **Y86 Instructions**