**November 4th**

**- main task of an assembler = generating the corresponding bytes**

- at any given moment ONLY ONE segment of every type may be ACTIVE

**- in 16 bits programming the segment registers CS, DS, SS, ES contained the STARTING ADDRESSES of the currently active segments**

**- in 32 bits programming the segment registers CS, DS, SS, ES contain the values of the SELECTORS of the currently active segments**

**- at any given moment during run time the CS:EIP combination of registers expresses /contain the address of the currently executed instruction**

**- these values are handled exclusively by BIU**

**- an assembly language instruction doesn’t support/allow both of its explicit operands to be from the RAM memory**

**- that is because BIU may "bring" only one memory operand at a time (for 2 memory operands we would need 2 BIU, 2 segment registers sets etc)**

***offset\_address* = [ base] + [ index × scale ] + [ constant]**

**(SIB) (displacement + immediate)**

*[prefixes] + code + [ModeR/M] + [SIB] + [displacement] + [immediate]*

**- the first 2 elements from the offset address computation formula (base and index\*scale) are expressed by the SIB byte from the internal format formula**

**- the third element: the constant, if present, is expressed by the displacement and/or immediate fields**

**- SIB and displacement participate ONLY to the offset computation of the memory operand, if there is any**

**- “immediate” field may be also involved in offset computation, but it can also appear INDEPENDENTLY from a memory operand, expressing in such a case an immediate operand (mov eax, 7 ; 7 is “immediate” and no memory operand present in the instruction)**

**- if Modr/m tells us that we have a register operand the next 3 fields from the internal format formula are absent (because if the operand is a register it can NOT be in the same time also a memory operand or an immediate value )**

**- if Modr/m tells us that we have a memory operand => SIB byte is mandatory, followed MAYBE by displacement and/or immediate**

**- the field “immediate” may participate to the offset computation of a memory operand (providing the “constant” field from the offset computation formula) or may appear only by itself expressing the immediate value of an operand (example: mov ebx, 12345678h)**

**- the displacement field expresses the direct addressing memory access**

**- immediate field = numerical constants**

- in the instructions used in our programs we will use almost exclusively only offsets,these being implicitely prefixed by one of the segment registers CS, DS,SS or ES. (ex. in debugger image - push variabila -> DS:[40100...])

- offset = an adress

**- direct addressing means direct access to the memory operand based on its offset, without needing / specifying any register in the offset specification formula (so no base or index !)**

**- if registers appear in the offset computation formula (base or index) => indirect addressing**

CS:EIP – The FAR (complete, full) address of the currently executing instruction

EIP – automatically incremented by the current execution

CS – contains the segment selector of the currently active segment and it can be changed only if the execution will switch to another segment

Mov cs, [var] - forbidden

Mov eip, eax - forbidden

 Jmp FAR somewhere   ; CS and EIP will be both modified !

Jmp start1 ; NEAR jmp – only the offset will be modified, so EIP !