Introduction to Intel x86-64 Assembly, Architecture, Applications, & Alliteration

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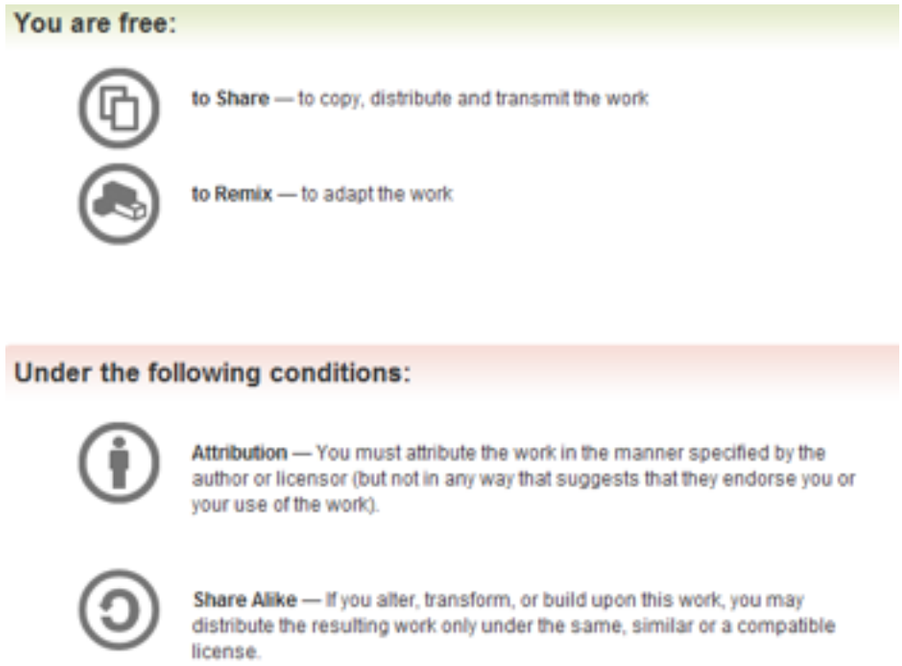

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Intel vs. AT&T Syntax

- Intel: Destination <- Source(s)
  - Windows. Think algebra or C: y = 2x + 1;
  - mov rbp, rsp
  - add rsp, 0x14 ; (rsp = rsp + 0x14)
- AT&T: Source(s) -> Destination
  - *nix/GNU. Think elementary school: 1 + 2 = 3
  - mov %rsp, %rbp
  - add $0x14,%rsp
  - So registers get a % prefix and immediates get a $
- My classes will use Intel syntax except in this section
- But it's important to know both, so you can read documents in either format.

Intel vs AT&T Syntax 2

- For instructions which can operate on different sizes, the mnemonic will have an indicator of the size.
  - movb - operates on bytes
  - mov/movw - operates on word (2 bytes)
  - movl - operates on “long” (dword) (4 bytes)
  - movq - operates on “quad word” (qword) (8 bytes)
- Intel indicates size with things like “mov *dword ptr* [rax], but it’s not in the actual mnemonic of the instruction
- Will occasionally see things like “movzwl” which is move with zero extend from a word to a long

Intel vs AT&T Syntax 3

- In my opinion the hardest-to-read difference is for r/m32 values
- For intel it's expressed as
  `[base + index*scale + disp]`
- For AT&T it's expressed as
  `disp(base, index, scale)`
- Examples:
  - call DWORD PTR [rbx+rsi*4-0xe8]
  - callq *-0xe8(%rbx,%rsi,4)
  - mov rax, DWORD PTR [rbp+0x8]
  - movq 0x8(%rbp), %rax
  - lea rax, [rbx-0xe8]
  - leaq -0xe8(%rbx), %rax

And some versions of the gnu tools, instead of using like "mov -0x4(%rbp)" will show it as "mov 0xFFFFFFFC(%rbp)"
Some more info talking about the differences
http://www.ibiblio.org/gferg/ldp/GCC-Inline-Assembly-HOWTO.txt
http://sig9.com/articles/att-syntax

TODO

- Create a game that shows two instructions in AT&T syntax and Intel syntax, and asks the students whether they're the same or not
- (The +100/-200 helps mitigate advantage of guessing)