Virtual Machine I

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Chapter 7, Textbook

- Section 7.1: Define VM translation. Define VM emulation.

  As described in the textbook, does Java use translation or emulation? Explain.

  Describe two benefits of the virtual machine paradigm.

  Write the stack machine code corresponding to these two expression:

  1. $d = (a + b) * (c + d)$
  2. $d = a + b * c + d$

  Assume that the stack is initially empty. Show the state of the stack after each stack instruction. (Stack pushes must occur in "left-to-right" order — `a` must be pushed before `b` and `b` must be pushed before `c`, etc. Respect operator precedence — operators of higher precedence are executed before operators of lower precedence; operators of equal precedence are executed in left-to-right order.)

- Section 7.2: Conceptually, explain what happens when each of the following VM instructions is executed:

```
push constant 42
pop argument 0
push argument 0
pop local 1

push constant 2
neg
push constant 0
lt
```

  What happens if the input to the VM translator software is a file? Is a directory?

- Section 7.3: What Hack architectural feature is used to maintain the VM's implicit stack?

  Suppose that two separate `vm` files, `a.vm` and `b.vm` belonging to the same program contain the instruction

```
pop static 3
```

  Explain why these two identical instructions result in Hack memory writes to *different* memory locations.

Chapter 7, Slides

- Slide 4: Does the VM define an architecture?
  Could we build a processor that implemented the VM's architecture?
- Slide 8: Where is the return value stored?
- Slide 12: Write Hack code implementing six VM instructions.