Arrays

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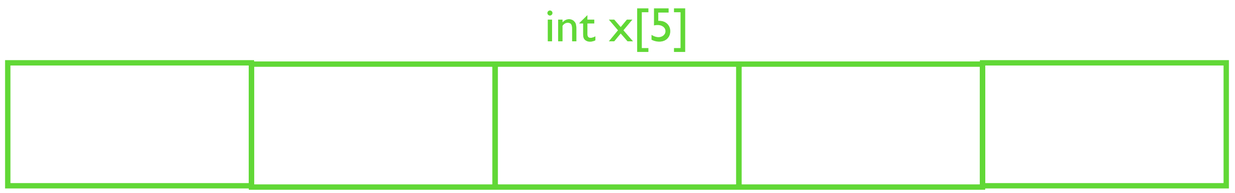

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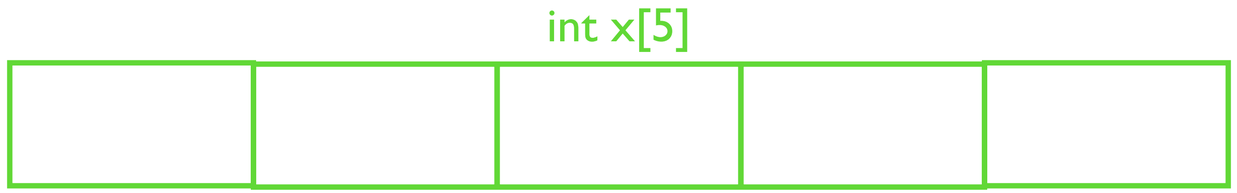

  - So how do we deal with arrays?

syntactic sugar

- C/C++ arrays are an example of **syntactic sugar**
  - New language constructs that are just alternate (simpler?) ways of expressing an existing mechanism in the language
  - Example:

```
(* ptr).x === ptr -> x
```

- Some languages, like Python, are *full* of syntactic sugar

```
a[i] === a.__getitem__(i) === type(a).__getitem__(a,i)
```

desugaring

- Syntactic sugar does not require introducing new mechanisms to the language
- It requires *translating* syntactic sugar back to its other representation: **desugaring**
- Code generation: desugar the construct, then generate code for the *underlying construct*

arrays in different languages

- Arrays in C/C++ are as simple as they get:
  - Just a sequence of boxes in memory

- Arrays in other settings are more complicated
  - More information: e.g., Java arrays, or STL vectors track size
  - More functionality: e.g., STL vectors can grow if more elements are added to the data structure
  - More safety: e.g., check to make sure that array accesses are not out of bounds

- Means that arrays are not just pure syntactic sugar. May involve other machinery

but

- Array-like data structures in other languages are often *backed* by C-like arrays
  - The underlying data is stored in consecutive boxes in memory

- In that case, the generated code to access the array still winds up looking like:
  1. Get base pointer address
  2. Add offset to base pointer
  3. Dereference computed address

- Fundamentally, C-like arrays are always accessed the same way (C's implementation of arrays just happens to be a close match to the low-level representation)

next: desugaring arrays