The C Language

CS238P: Operating Systems - Fall '18

Aftab Hussain
(Adapted from Vikram Narayanan's slides for ICS143A Fall'17)

October 12, 2018

University of California, Irvine

Data and Computation

Data

Data can be of different types.

- char (1 byte)
- int, long (4/8 bytes)
- pointer (2, 4, or 8 bytes on x86 16, 32, and 64 bit machines respectively), structs, etc.

They can also be:

- constants
- variables

Data Variable

A data type therefore determines two things[1]:

- the size of the data variable
- how the data is to be interpreted.

[1] https://www.tutorialspoint.com/cprogramming/c_data_types.htm

Computation

Statements

- declarations
- assignments
- `for`, `do...while`, `while`

Hw1(xv6 shell)

- if...else

```
pid = fork();
if(pid == -1)
  perror("fork:");
```

Hw1(xv6 shell)

- if...else

```
pid = fork();
if(pid == -1)
  perror("fork:");
```

- switch...case

```
switch(cmd->type){
case '>': ...; break;
default: ...; break;
}
```

Hw1(xv6 shell)

- `if...else`

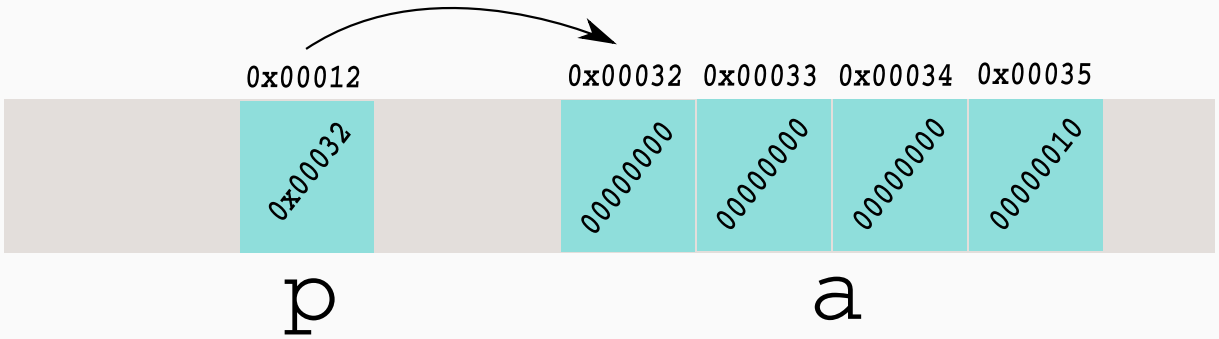
```
pid = fork();
if(pid == -1)
  perror("fork:");
```

- `switch...case`

```
switch(cmd->type){
case '>': ...; break;
default: ...; break;
}
```

- Functions
  - Process creation (`fork`, `exec`)
  - File I/O (`open`, `close`, `read`, `write`)

Pointers



(a)

```
int a = 5;
int *p = &a;
```

(b)

Fig. 1(a). Simple illustration of how a pointer points to data in the memory. (b) Corresponding C code for Fig. 1(a).

Arrays

- Collection of objects of the same data type

Arrays

- Collection of objects of the same data type
- Accessed by index (`0 ... size - 1`)

Arrays

- Collection of objects of the same data type
- Accessed by index (`0 ... size - 1`)
- String is an array of characters

Array Intialization

Designated Initializers[2]

```
#define CAPSLOCK (1<<3)
#define NUMLOCK (1<<4)
#define SCROLLLOCK (1<<5)
static uchar togglecode[256] = {
[0x3A] CAPSLOCK,
[0x45] NUMLOCK,
[0x46] SCROLLLOCK
};
/* equivalent to */
togglecode[0x3A] = CAPSLOCK;
togglecode[0x45] = NUMLOCK;
togglecode[0x46] = SCROLLLOCK;
```

Initialize the array elements 0x3A, 0x45, 0x46 only [3]

[2] http://gcc.gnu.org/onlinedocs/gcc-4.0.4/gcc/Designated-Inits.html
[3] sheet 77, xv6-rev9.pdf

Examples

(arrays-ptrs.c & arrays-strings.c)