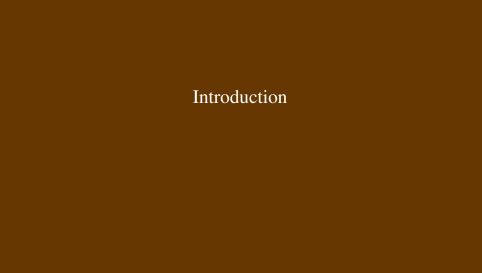


C Programming I

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Outline

- Introduction
- Program Structure
- Basic Syntax
- Data Types, Variables and Constants
- 5 Control Structures: for, if & switch



What is the C Language?

- A general-purpose, procedural, imperative computer programming language.
- Developed in 1972 by Dennis M. Ritchie at the Bell Telephone Laboratories to develop the UNIX operating system.
- The UNIX operating system, the C compiler, and essentially all UNIX applications programs have been written in C.
- C is the most widely used computer language.
 - Easy to learn
 - Structured language
 - Produces efficient programs
 - Handles low-level activities
 - Can be compiled on a variety of computer plaforms
- Most of the state-of-the-art softwares have been implemented using C.
- Today's most popular Linux OS and RBDMS MySQL have been written in C.

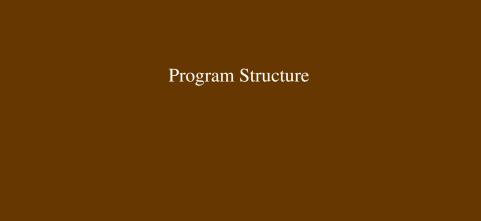
What do you need to learn C?

C Compiler

- What is a Compiler?
 - A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language, often having a binary form known as object code).
- How does a compiler do?
 - Translate C source code into a binary executable
- List of Common Compilers:
 - GCC GNU Project (Free, available on most *NIX systems)
 - Intel Compiler
 - Portland Group (PGI) Compiler
 - Microsoft Visual Studio
 - IBM XL Compiler

Text Editor

- Emacs
- VI/VIM
- Notepad++ (avoid Notepad if you will eventually use a *NIX system)
- Integrated Development Environment: Eclipse, XCode, Visual Studio, etc



Program Structure

A C Program consists of the following parts

- Preprocessor Commands
- Functions
- Variables
- Statements & Expressions
- Comments

A Simple Hello World Code

```
#include <stdio.h>
int main ()
{
   /* My First C Code */
   printf("Hello World!\n");
   return 0;
}
```

Compile and execute the code

```
dyn100077:Exercise apacheco$ gcc hello.c
dyn100077:Exercise apacheco$ ./a.out
Hello World!
```

My First C Code

```
#include <stdio.h>
int main ()
{
   /* My First C Code */
   printf("Hello World!\n");
   return 0;
}
```

- #include <stdio.h> is a preprocessor command.

 It tells a C compiler to include stdio.h file before going to actual compilation.
- int main () is the main function where program execution begins.
- /* ... */ is a comment and ignored by the compiler.
- printf(...) is function that prints Hello World! to the screen.
- return 0; terminates main() function and returns the value 0.



Basic C Syntax I

- C is a case sensitive programming language i.e. program is not the same as Program or PROGRAM.
- Each individual statement must end with a semicolon.
- Whitespace i.e. tabs or spaces is insignificant except whitespace within a character string.
- All C statments are free format i.e. no specified layout or column assignment as in FORTRAN77.

```
#include <stdio.h>
int main () { /* My First C Code */ printf("Hello World!\n"); return 0;}
```

will produce the exact same result as the code on the previous slide.

 In C everything within /* and */ is a comment. Comments can span multiple lines.

```
/* this is single line comment */
/* This
is a
multiline comment */
```

Basic C Syntax II

- Always use proper comments in your code. Your code will most likely be handed to someone long after you are gone.
- Comments are completely ignored by compiler (test/debug code)

Data Types, Variables and Constants

Data Types

Basic Types: There are five basic data types

- int integer: a whole number.
- ② float floating point value: ie a number with a fractional part.
- Odouble a double-precision floating point value.
- char a single character.
- o void valueless special purpose type.

Derived Types: These include

- Pointers
- Arrays
- Structures
- Union
- Function
- The array and structure types are referred to collectively as the aggregate types.
- The type of a function specifies the type of the function's return value.

Basic Data Types: Integer

| Type | Storage size (in bytes) | Value range |
|----------------|-------------------------|---------------------------------|
| char | 1 | -128 to 127 or 0 to 255 |
| unsigned char | 1 | 0 to 255 |
| signed char | 1 | -128 to 127 |
| | 2 | -32,768 to 32,767 |
| int | or | or |
| | 4 | -2,147,483,648 to 2,147,483,647 |
| | 2 | 0 to 65,535 |
| unsigned int | or | or |
| | 4 | 0 to 4,294,967,295 |
| short | 2 | -32,768 to 32,767 |
| unsigned short | 2 | 0 to 65,535 |
| long | 4 | -2,147,483,648 to 2,147,483,647 |
| unsigned long | 4 | 0 to 4,294,967,295 |

- To get the exact size of a type or a variable on a particular platform, you can use the size of operator.
- The expressions sizeof(type) yields the storage size of the object or type in bytes.

Basic Data Types: Floating-Point & void

| Type | Storage size | Value range | Precision (decimal places) |
|-------------|--------------|-----------------------|----------------------------|
| float | 4 bytes | 1.2E-38 to 3.4E38 | 6 |
| double | 8 bytes | 2.3E-308 to 1.7E308 | 15 |
| long double | 10 bytes | 3.4E-4932 to 1.1E4932 | 19 |

| Situation | Description |
|----------------------------|-----------------------------------|
| function returns as void | function with no return value |
| function arguments as void | function with no parameter |
| pointers to void | address of an object without type |

Input and Output

- C or any programming language in general needs to be interactive i.e. write something back and optionally read data to be useful.
- Similar to Unix, C treats all devices as files.

| Standard File | File Pointer | Device |
|-----------------|--------------|----------|
| Standard Input | stdin | Keyboard |
| Standard Output | stdout | Screen |
| Standard Error | stderr | Screen |

 C Programming language provides three functions to read/write from standard input/output

| | Unformatted | | Formatted |
|--------|-------------|------|-----------|
| Input | getchar | gets | scanf |
| Output | putchar | puts | printf |

Unformatted I/O

The getchar() & putchar() functions

- The int getchar (void) function reads the next available character from the screen and returns it as an integer.
 - This function reads only single character at a time.
- The int putchar (int c) function puts the passed character on the screen and returns the same character.
 - This function puts only single character at a time.

The gets() & puts() functions

- The char *gets(char *s) function reads a line from stdin into the buffer pointed to by s until either a terminating newline or EOF.
- The int puts (const char *s) function writes the string s and a trailing newline to stdout.

```
#include <stdio.h>
int main()
{
   int c;
   printf( "Enter a value :");
   c = getchar();
   printf( "\nYou entered: ");
   putchar( c );
   return 0;
}
```

```
#include <stdio.h>
int main()
{
    char str[100];
    printf( "Enter a value :");
    gets( str );
    printf( "\nYou entered: ");
    puts( str );
    return 0;
}
```

Formatted I/O

- The int scanf(const char *format, ...) function reads input from the standard input stream stdin and scans that input according to format provided.
- The int printf(const char *format, ...) function writes output to the standard output stream stdout and produces output according to a format provided (optional).

```
#include <stdio.h>
int main ()
{
    /* My Second C Code */
    char name[100];
    printf("Enter your name:");
    scanf("%s", name);
    printf("Hello %s\n", name);
    return 0;
}
```

• The format specifier: %[flags][width][.precision][length]specifier

| flag | meaning |
|------|------------------------|
| - | left justify |
| + | always display sign |
| 0 | pad with leading zeros |

Control Structures: for, if & switch

Title

