Basics of ‘C’

BY DR. SHEFALI ARORA

NIT JALANDHAR

low level or high level?

- A low level language is machine dependent
- High level language is computer independent and translated into computer understandable code by a compiler

Some Languages by Paradigm

- Imperative (also called Structured or Procedural) Programming
  - FORTRAN, BASIC, COBOL, Pascal, C
- Object-Oriented Programming
  - SmallTalk, C++, Java
- Functional Programming
  - LISP, ML, Haskell

History of Languages

- 1950s to 1960s
  - FORTRAN, COBOL, LISP, BASIC
- 1960s to 1970s
  - (ALGOL-based) Pascal and others
- 1970s to 1980s
  - Prolog, C, Ada
- 1980s to 1990s
  - C++, ML, Perl, Java

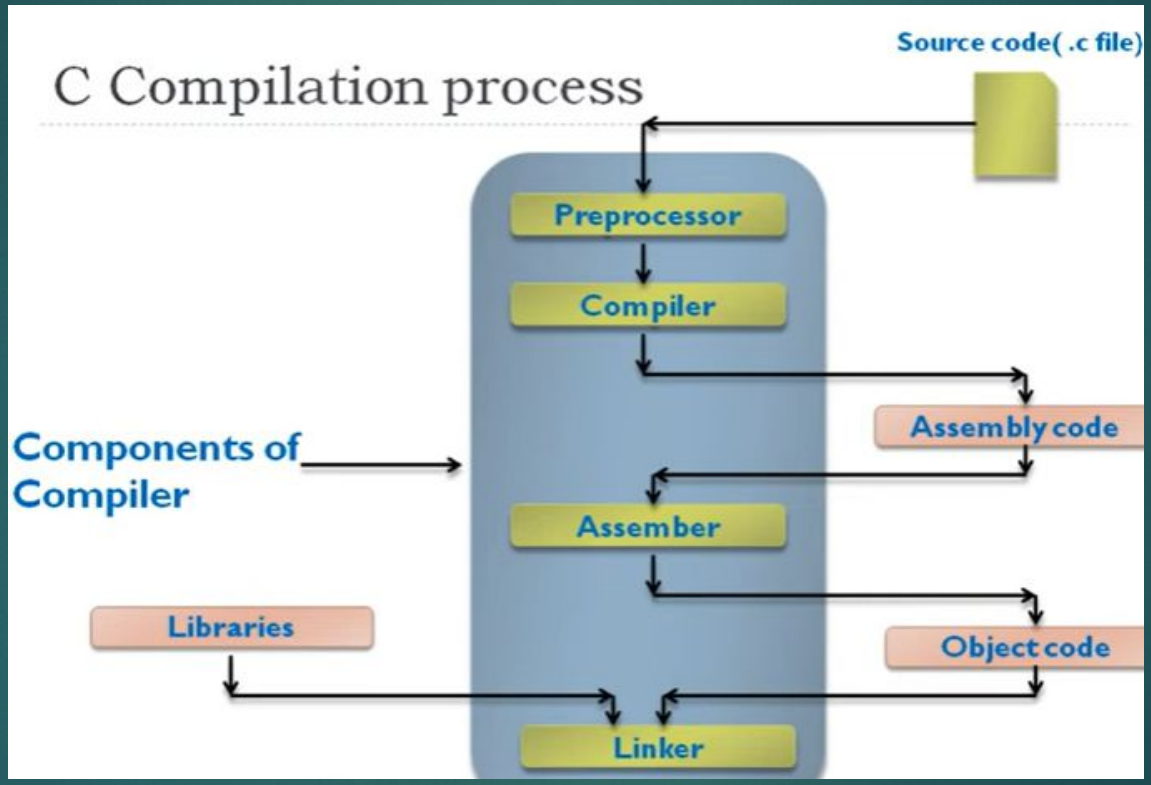
Paradigm Change

- For example, from Procedural to Object-Oriented Programming
- Arises from problems encountered in one paradigm but addressed in another
- Case study: from C to C++
  - Evolution from procedural, to modular, to object-based, to object-oriented programming

BASIC C CODE

```
#include<stdio.h>
int main()
{
   printf("Hello World");
    return 0;
}
```

THE PROCESS OF COMPILATION



PREPROCESSING

- Remove comments from code
- Include header files in the code
- Substitute values of macros

Compilation

- Compiler generates assembly code
- Assembler converts generated code into binary code or machine language
- This is also known as object code

LINKER

- Merge all object codes into single one
- In case we are using any library functions, linker will link our code with those libraries
- Can be static or dynamic
- Generates .exe file

General Aspect of ‘C’

- C WAS ORIGINALLY DEVELOPED IN THE 1970S, BY DENNIS RITCHIE AT BELL TELEPHONE LABORATORIES, INC.
- C IS A HIGH LEVEL , GENERAL –PURPOSE STRUCTURED PROGRAMMING LANGUAGE.
- INSTRUCTIONS OF C CONSISTS OF TERMS THAT ARE VERY CLOSELY SAME TO ALGEBRAIC EXPRESSIONS, CONSISTING OF CERTAIN ENGLISH KEYWORDS SUCH AS IF, ELSE, FOR ,DO AND WHILE

The Character set of ‘C’

- C LANGUAGE CONSIST OF SOME CHARACTERS SET, NUMBERS AND
- SOME SPECIAL SYMBOLS. THE CHARACTER SET OF C CONSIST OF ALL THE ALPHABETS OF ENGLISH LANGUAGE.
- SPECIAL SYMBOLS {,},[,],?,+,-,*,/,%,!,;,AND MORE
- 1) IDENTIFIERS 2)KEYWORDS 3)CONSTANTS
- 4) OPERATORS 5)PUNCTUATION SYMBOLS

Identifiers

- A 'C' program consist of two types of elements , user defined and system defined. Idetifiers is nothing but a name given to these elements.
- An identifier is a word used by a programmer to name a variable , function, or label.
- identifiers consist of letters and digits, in any order, except that the first character or lable.
- Identifiers consist of letters and digits if any order,except that the first character must be letter.
- Both Upper and lowercase letters can be used

Keywords

- Keywords are nothing but system defined identifiers.
- Keywords are reserved words of the language.
- They have specific meaning in the language and cannot be used by the programmer as variable or constant names
- C is case senitive, it means these must be used as it is
- 32 Keywords in C Programming

auto	double	int	struct
break	else	long	switch
case	enum	register	typedef
char	extern	return	union
const	float	short	unsigned
continue	for	signed	void
default	goto	sizeof	volatile
do	if	static	while

Variables

- A variable is nothing but a name given to a storage area that our programs can manipulate. Each variable in C has a specific type, which determines the size and layout of the variable's memory; the range of values that can be stored within that memory; and the set of operations that can be applied to the variable.
- The name of a variable can be composed of letters, digits, and the underscore character. It must begin with either a letter or an underscore. Upper and lowercase letters are distinct because C is case-sensitive. There are following basic variable types −

Type	Description
char	Typically a single octet(one byte). This is an integer type.
int	The most natural size of integer for the machine.
float	A single-precision floating point value.
double	A double-precision floating point value.
void	Represents the absence of type.

Constants

- A constant is a value or an identifier whose value cannot be altered in a program. For example: 1, 2.5,
- As mentioned, an identifier also can be defined as a constant. eg. const double PI = 3.14
- Here, PI is a constant. Basically what it means is that, PI and 3.14 is same for this program.

Integer constants

- A integer constant is a numeric constant (associated with number) without any fractional or exponential part. There are three types of integer constants in C programming:

- decimal constant(base 10)
- octal constant(base 8)
- hexadecimal constant(base 16)

Constants

Floating-point constants

- A floating point constant is a numeric constant that has either a fractional form or an exponent form. For example: 2.0,0.0000234,-0.22E-5

Character constants

- A character constant is a constant which uses single quotation around characters. For example: 'a', 'l', 'm', 'F'

String constants

- String constants are the constants which are enclosed in a pair of double-quote marks. For example: "good" ,"x","Earth is round\n"

Escape Sequences

Sometimes, it is necessary to use characters which cannot be typed or has special meaning in C programming. For example: newline(enter), tab, question mark etc. In order to use these characters, escape sequence is used.

- For example: \n is used for newline. The backslash (\ ) causes "escape" from the normal way the characters are interpreted by the compiler.Escape

Sequences	Character
\b	Backspace
\f	Form feed
\n	Newline
\r	Return
\t	Horizontal tab
\v	Vertical tab
\\	Backslash
\'	Single quotation mark
\"	Double quotation mark
\?	Question mark
\0	Null character

Operators in C: An operator is a symbol which operates on a value or a variable. For example: + is an operator to perform addition.

C programming has wide range of operators to perform various operations. For better understanding of operators, these operators can be classified as:

- Arithmetic Operators
- Increment and Decrement Operators
- Assignment Operators
- Relational Operators
- Logical Operators
- Conditional Operators
- Bitwise Operators
- Special Operators

Arithmetic Operator

- Operator Meaning of Operator
- + addition or unary plus
- - subtraction or unary minus
- * multiplication
- / division
- % remainder after division(modulo division)

Increment and Decrement Operators

1. C programming has two operators increment ++ and decrement -- to change the value of an operand (constant or variable) by 1.
2. Increment ++ increases the value by 1 whereas decrement -- decreases the value by 1.
3. These two operators are unary operators, meaning they only operate on a single operand.

eg. int a=10, b=100

++a = 11

--b = 99

C Assignment Operators

- An assignment operator is used for assigning a value to a variable. The most common assignment operator is =

Operator	Example	Same as
=	a = b	a = b
+=	a += b	a = a+b
-=	a -= b	a = a-b
*=	a *= b	a = a*b
/=	a /= b	a = a/b
%=	a %= b	a = a%b

C Relational Operators

- A relational operator checks the relationship between two operands. If the relation is true, it returns 1; if the relation is false, it returns value 0.
- Relational operators are used in decision making and loops.

Operator	Meaning of Operator	Example
==	Equal to	5 == 3 returns 0
>	Greater than	5 > 3 returns 1
<	Less than	5 < 3 returns 0
!=	Not equal to	5 != 3 returns 1
>=	Greater than or equal to	5 >= 3 returns 1
<=	Less than or equal to	5 <= 3 return 0